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THE

ELECTRICAL REVIEW

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INDEX TO THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW ADVERTISEMENTS.

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(The numbers refer to the page on which the displayed advertisement will be found.)

PAGE
Cabinet Work.
G. Beech 8
W. M. Foxcroft 8
Clock Synchronising.
Barraud & Lunds... 6
Educational.
School of Telegraphy 9
Electrical Engineers and Contractors.
Callender's Bitumen Telegraph, &c., Co. 7
W. T. Henley 5
Hooper & Co. 1
India-rubber and Telegraph Works Co. 12
Johnson & Phillips 1
E. Paterson 11
Electric Light.
J. Edmundson & Co. (Swan) 5
Edison Electric Light Co., Limited ... 7
Griffith & Co. 4
Pilsen-Joel and General Electric Light Company, Limited 2
Electric Light Carbons.
American Carbon Co. 8
Electric Motor.
Electro Dynamic Co. 9
Engines for Electric Light.
Peter Brotherhood 6
Globes for Electric Lights.
G. Houghton & Son 8
Insulators.
Bourne & Co. 5
David Brooks 5
G. Johnson & Sons 4
Stiff & Sons 4
Lightning Conductors.
Newall & Co. 10
Machinery.
Thos. Barraclough & Co. (Limited) ... 5
Manufacturing Electricians.
T. Crampton & Co. 4
H. & E. J. Dale 4
J. T. Gent & Co.... 4
J. Orme & Co. 6
F. A. Stevens 5
Patent Agents.
E. P. Alexander 6
H. Gardner 8
Patent Office Researches.
"B. X." 8
F. M. Rogers 8
Porous Cells.
J. Stiff & Sons 4
Publications.
"Railway Supplies Journal" 8
Screws.
Davis & Timmins... 10
International Machine Company ... 4
Telephones.
W. C. Barney 10
Blakey, Emmott & Co. 8
Harrison, Cox-Walker & Co. 9
Swiss Telephone Company 11
M. Theiler & Sons 6
Wood Engraver.
R. A. Cheffins 4
Wire (covered).
W. T. Glover & Co. 2
London Electric Wire Company ... 9
Phillips Brothers 11
Wire (uncovered).
Cooke & Co. 5
R. Johnson & Nephew 8
Ramsden, Camm, & Co. 7
F. Smith & Co. 8
Webster, Horsfall & Lean 9

THE TELEGRAPHIC JOURNAL AND
ELECTRICAL REVIEW.

Vol. XI. AUGUST 12, 1882. No. CCXLVI.

CONTENTS:

	PAGE
Electrical Engineering	99
On the Electromotive Force of a Zinc-carbon Element	100
Garnier's Combination Rheostat (*illustrated*)	101
The Electric Lighting Bill	101
The Electric Lighting of the Comptoir d'Escompte by Bichromate Batteries on the Jarriant and Grenet System	102
Correspondence :—	
A Magnetometer for the Determination of the Pole-strength of Magnets (*illustrated*)	103
The Rival Telephone Companies	104
Multiple Telephone Signalling	104
Electric Lighting	104
The City and Guilds of London Institute Technological Examination	104
Correspondence—*continued*—	
The City and Guilds Examination	105
The United Telephone Company	105
Notes	106
New Patents—1882	110
Abstracts of Published Specifications—1881	110
City Notes :—	
Anglo-American Telegraph Company, Limited	113
South-Eastern Brush Electric Light Company	116
Provincial (Brush) Electric Light and Power Co., Limited	118
Quotations	118
Traffic Receipts	118

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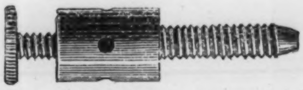

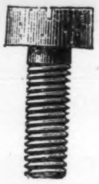

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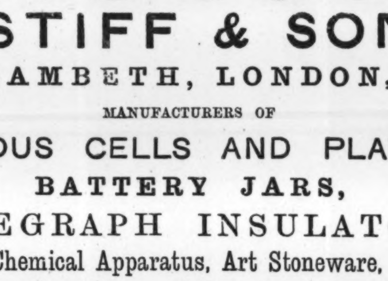
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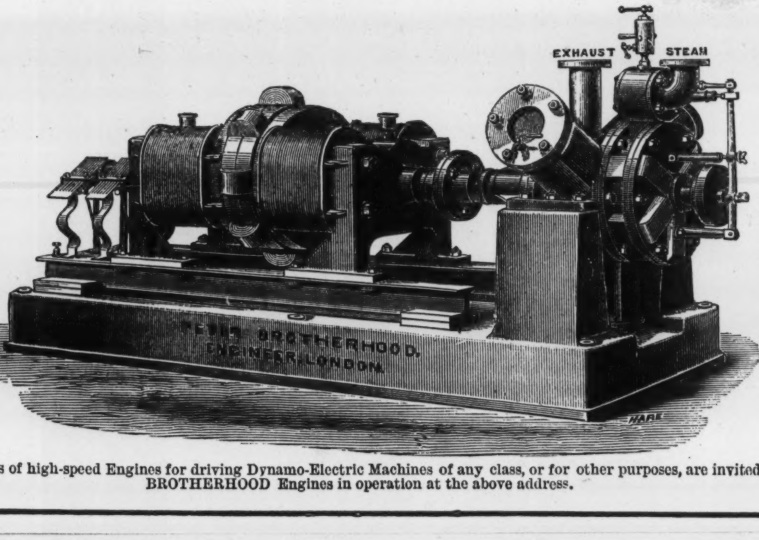

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THE TELEGRAPHIC JOURNAL AND
Electrical Review.
Vol. XI.—No. 246.

ELECTRICAL ENGINEERING.

Only a few years since young men desirous of entering the electrical profession were limited to the single branch of telegraphy, and their choice necessarily lay between becoming practical operators, skilled electricians, or manufacturers of electrical apparatus and appliances. The first-mentioned class, of course, is composed of a large body of generally intelligent men; for, wherever a telegraph line, whether overhead or submarine, exists, there must also be the operator. The skilled electricians and manufacturers are, however, comparatively few, and for some time past the former certainly have had little chance of improving their positions, simply because until recently no other branch of electrical science was open to them. During the last six years or so, such progress has been made in other ways than telegraphy of pressing electricity into our service that no person with only a moderate knowledge even of this fascinating pursuit should be unable to keep himself well employed. To young electricians of eight or ten years ago it was the height of ambition to be connected with submarine telegraphy, either in the service of the cable manufacturers or in that of some telegraph company. The work of testing cables, although somewhat monotonous, is of a more scientific, and therefore of a more interesting, character than any other branch of telegraphy. Their manufacture, too, is a subject for particular study, and a good knowledge of machinery may be gained in a cable factory. Then, perhaps, the best part of all, the life on board ship when the cable leaves the manufactory, the laying, and the homeward voyage—all this was calculated to centre the thoughts of young men engaged in electrical work, upon submarine telegraphy. The bright side of a submarine telegraph engineer's life is a very fair one, but the reverse must not be forgotten. The junior or assistant electricians should always remember that there are many slack periods in cable operations, and it is then often necessary that the *personnel* of the staff should be reduced. When such a proceeding as this took place at the period we are speaking of, it was sometimes a very difficult matter for the young electrician to find other employment. We think, however, that this is a contingency not to be feared in the present day.

We have now several branches of electrical engineering other than the telegraph, one of which at least (telephony) will become as important. What with this, electric lighting, electric railways, &c., the present difficulty is to find men competent to perform the work they are called upon to do. To prove this we have only to quote the remarks of Mr. W. H. Preece, F.R.S., who examined the candidates in telegraphy at the recent examination of the City and Guilds of London Institute.

The examiner says:—

> The papers of the competitors in the first class of the Honours examination are of very fair merit. The replies given in the Ordinary, or Pass, examination are not altogether of a satisfactory character, except in one or two cases. The competitors who have taken but a low place in the second class, and those who have not passed, have, in many cases, shown that the knowledge they possess of the subjects they deal with is of a mere mechanical nature, and has simply been attained from constant practice at a particular system with which they have had to deal, and they appear to have but little notion of the broad principles upon which that particular system is founded; thus, for instance, they describe at full length, and quite correctly, the methods of making tests with particular forms of apparatus, but it is quite evident that if these tests had to be made with instruments which were slightly different in character to those described the experimenter would be unable to carry them out. In one or two instances the answers given have been merely definitions, such as would be found in any technical dictionary.
>
> Altogether, I think the character of the papers submitted is superior to those of former years.

Again in the same examinations on electric lighting, Professor W. E. Ayrton, F.R.S., says:—

> The answers to the questions set at the recent Technological Examinations in Electric Lighting and Transmission of Power show that the candidates, with a few striking exceptions, have hardly advanced beyond the mere descriptions of the construction of machines, and have had little opportunity of studying the science underlying their trade. Considering, however, how very difficult it is for students to find men who are competent, and who at the same time have sufficient leisure to teach, the answers in this subject may be regarded as fairly good.

Although these reports are not particularly favourable we trust that the students who sat at these examinations will not be discouraged with the results of their labours, but rather turn again more earnestly than ever to their studies with the assurance that a fair knowledge of electrical science should procure for them good and profitable employment. We do not know what questions were given, either in telegraphy or in electric lighting, for the purposes of the examination we have referred to, but there is usually a tendency on the part of examiners to find out, not what the students know, but rather what they do not know; or, in other words, the questions are generally set in such a way as to impress one with the profound knowledge of the examiner himself, but not so as to bring out the students' acquaintance with the every-day work he is likely to be engaged in. Enough has been shown, however, to prove that our supply of competent electricians for our most recent industries is very small, and we cannot imagine a brighter prospect for young men desirous of acquiring a profession than that of electrical engineering.

Professor Ayrton's remarks as to the difficulty of finding competent teachers is true enough so far as institute or college teaching is concerned, and therefore the youthful aspirant's best method of gaining the necessary knowledge will be to apply for a pupilage with a firm of electrical engineers or in a company. This is generally the way in which a youth is introduced into the profession of a civil engineer, and if he chooses to supplement his daily practice by private lessons, or in the classes attached to an institute like that of the City and Guilds of London, so much the better for his chances of advancement. We are still only at the commencement of the work to be done in electric lighting; electric railways, beyond an experimental trial or so, have as yet only been talked of; and the telephone industry, which should rival, if not surpass, that of the telegraph, has up to the present been crippled for reasons not necessary to refer to here. Electrical engineering may, therefore, assume at any moment an importance of such magnitude that we shall fail to take full advantages of the opportunities offered simply because we are not prepared to deal with the work put before us. Let those men already possessed of a competent knowledge of electrical matters be ready to seize upon the first opportunity of entering the sphere of the more recent discoveries and thus gain for themselves positions they might wait for in vain in the established branches of electrical science.

ON THE ELECTROMOTIVE FORCE OF A ZINC-CARBON ELEMENT.

By M. BERTHELOT.

I HAVE measured, by the aid of a Mascart's electrometer, the electromotive force of a zinc-carbon element immersed in dilute sulphuric acid.

This force varies very rapidly by reason of polarisation, and the chemical effects which it is able to set up vary exactly in the same proportion.

When the circuit is closed the electromotive force of a zinc-carbon element much surpasses that of a zinc-platinum element, the proportion being as 1·76 : 1. It also surpasses that of a Daniell element in the proportion of 1·29 : 1—that is, it is approximately equal to the sum of the forces of a Daniell and of a zinc-cadmium element combined. At the moment when the two poles of the zinc-carbon element are connected its electromotive force surpasses even this sum, and the ratio of the said force to that of a Daniell may be as 1 : 1·37, but the force falls immediately to 1·30 or 1·29. It has then about double the force of a zinc-platinum element—*i.e.*, two zinc-carbon elements are more powerful than three zinc-platinum elements all alike plunged in dilute sulphuric acid.

But this force does not remain long at its initial value ; it is sufficient to maintain the circuit closed for a few minutes by means of a copper wire of a diameter of about ¾ millimetre and 0·20 metre in length, to see the electromotive force of a zinc-carbon become equal to that of a Daniell (0·995 : 1). At this moment two zinc-carbons are surpassed by three zinc-platinums. After the circuit has been closed for some hours a zinc-carbon falls below a Daniell, the ratio being 0·83, and the electromotive force is very near that of a zinc-platinum. Lastly, after the circuit has been closed for thirty-six hours one Daniell may even surpass two zinc-carbons, at least in the first moments which follow the opening of the circuit and the connection of the two poles with the electrometer.

If I make this reservation it is because the electromotive force, which has fallen to the lowest point while the circuit is closed, tends to increase little by little when it is re-opened. The electrometer shows very distinctly these variations. Thus, after the circuit has been closed for some minutes, the electromotive force of a zinc-carbon, compared after opening to that of a Daniell in the electrometer, has been found 0·67, in a few moments 0·74, then 0·83, and, finally, 0·98, which value is approximately stationary. In the same manner, after the circuit has been closed for some hours, I have found 0·52, then 0·63, and then 0·76, a value almost stationary and answering to that of a zinc-platinum element.

It is sufficient to take the battery to pieces and steep the carbon and the porous vessels in pure water, renewed several times, for some hours in order to restore the original electromotive force. This may be done several times in succession, and, without doubt, may be repeated indefinitely.

Hence it appears that we have to do with the effects of polarisation well known to all physicists. These effects are due, as is known, to more or less complex compounds formed upon the electrodes, the presence of which gives rise to electromotive forces of a contrary direction to those of the principal action. These compounds are of two kinds, the one kind stable, but capable of being removed by washings, which restores to the battery all its initial electromotive force ; the others unstable, dissociable, capable of being destroyed by diffusion, combined to the oxidising action of the air, as is shown by the variation of the electromotive force immediately after the opening of the circuit.

However this may be, the facts just detailed prove that the zinc carbon battery is unfit for any operation which requires a constant electromotive force.

Let us now show the correlative variation of the chemical effects. At the outset, theory indicates that the electromotive force of the zinc-carbon element, as it has been actually measured, should be able to produce any electrolytic reaction which consumes energy inferior to 24·5 × 1·3 = 32 calories per equivalent of the body decomposed, I have proved that a zinc-carbon element does not decompose acidulated water (34·5 calories), but on adding a zinc-cadmium element (8 calories, which makes 40 calories) the decomposition is produced.

Two zinc-carbon elements are equal at the outset to 64 calories, they should, therefore, decompose sulphate of potash, and, in fact, they do so. For this decomposition 51·5 calories are necessary.

We see hence the error committed by M. Tommasi, when he believes that he has produced this decomposition by the mere force resulting in two consecutive couples from the formation of sulphate of zinc from metallic zinc and dilute sulphuric acid. In reality such a force is incapable of producing any electrolytic decomposition which consumes more than 19 × 2 = 38 calories per equivalent. If two zinc-carbons decompose sulphate of potash whilst two zinc-platinums are unable, it is because the chemical reactions which develop the electromotive forces are not the same in the two systems.

Let us pursue this demonstration : as the electromotive force of the zinc-carbon decreases, its chemical power diminishes. After some hours, when the measurements show that the force of the two zinc-carbons is fallen below that of two Daniells (49) they cease to decompose sulphate of potash (51·5). When it is reduced to that of two zinc-platinums (36 — 38) they still decompose acidulated water (34·5), but it is necessary to connect to them two zinc-cadmiums (38 + 16 = 54) to decompose sulphate of potash the addition of a single zinc-cadmium being insufficient.

If I have thought it necessary to insist upon these facts, upon the direct measurement of the electromotive forces and on their continuous correlation with the energy brought into play in chemical reactions both within and without the pile, it is that there may exist neither doubt nor confusion on the fundamental laws of electro-chemistry.

M. Tommasi replied to this as follows :—

Hitherto it has always been admitted that in any element whatsoever the nature of the positive electrode had no influence upon the electromotive force, provided that this electrode was not attacked by the exciting liquid. In the bichromate of potash element alone a difference has been observed in the electromotive force, according as the positive electrode was of platinum or of carbon. I have already pointed out this fact, and I shall return to it in detail in speaking of the chromic acid element. As for Smee's element with dilute sulphuric acid, it has always been believed that the nature of the positive electrode does not sensibly affect its electromotive force. "It is thus," says M. Du Moncel, "that silver, lead, carbon, copper, aluminium, iron in the passive state, have been able to be substituted for the platinum of Smee's battery, without any difference in the electric action other than that derived from the polarisation which these plates might effect.

It appears, therefore, that the augmentation of the electromotive force which I have demonstrated in the zinc-carbon element constitutes a novel fact, not without a scientific interest.

It is known to all that the electrolytic work effected by an element is so much the more considerable as its electromotive force, measured by the electrometer, is more intense. Consequently it is not surprising that M. Berthelot has found, by means of Mascart's electrometer, that the zinc-carbon element has a greater electromotive force than a zinc-platinum element. Since it is known, according to my experiments, that the chemical work produced by the zinc-carbon element is much greater than that obtained with the zinc-platinum element, it would have been, indeed, strange and contrary to all known facts if the electrometric determinations executed by M. Berthelot had proved the contrary.

I had intended to complete my researches on the zinc-carbon element with electrometric determinations ; but as M. Berthelot has anticipated me it only remains for me to observe that all the experiments which this *savant* has described in no way tell against my researches, but, on the contrary, give them a greater degree of certitude. I have never said that a zinc-carbon element was equal to a zinc-platinum element, for the simple reason that I have proved quite the contrary. I have certainly not sought to show that the zinc-carbon element produced an electromotive force greater than the zinc-platinum element, in order to infer that these elements were mutually equivalent.

In my last note I have merely brought forward facts, and these facts are perfectly exact, as M. Berthelot has been able to convince himself when he repeated my experiments, in order to complete them by electrometric determinations. As to the interpretation of these facts I have not said a word, and consequently M. Berthelot ascribes to me things which I have never thought.—*Comptes Rendus.*

GARNIER'S COMBINATION RHEOSTAT.

The combination rheostat of M. Garnier, which was exhibited at the Electrical Exhibition at Paris in 1881, has for its object the immediate combination of a number of resistances, so as to form a total equal to any required value. The resistance boxes usually employed contain bobbins which are multiples of an arbitrary unit, the ohm, for example, and are so selected, that they can be grouped together, so as to form any required total; by this arrangement any resistance whatever, from the unit upwards and varying by equal graduations, can be obtained. Thus, with the multiples which have been long employed, namely, 1, 2, 2, 5—10, 20, 20, 50—100, 200, 200, 500, any number from 1 to 10,000, each differing by one unit, can be formed, provided that one does not exceed twice the last term of the series. But if it is required to form rapidly any given resistance, it is difficult to avoid various changes of the plugs, in order to obtain the required combination; this operation is analogous to the operation of weighing, and one knows how much time is lost in the employment of a balance and marked weights.

With the cylindrical rheostat one can form immediately any arbitrary rsistance, and can also increase or diminish it regularly by degrees corresponding to any decimal unit. This apparatus consists of a certain number of dials, units, tens, and hundreds, for example, each having eleven divisions (0 to 10), over which a pointer moves. Each needle is mounted on the axis of a cylinder, which has for its object, in each of its positions, the introduction of such bobbins as will together form the exact resistance indicated by the pointer. The "unit" cylinder is connected to bobbins 1, 2, 2, 5; the "ten" cylinder is connected to bobbins 10, 20, 20, 50, and so on. It will be sufficient to explain the construction of one of these cylinders. Let us suppose the four bobbins to be connected, as indicated by fig. 1, to five metal plates, A, B, C, D, E; if these plates remain insulated from each other, the circuit M, N, contains the resistance of all the bobbins, that is to say, 10 ohms; if a combination is effected by metallic connections, of inappreciable resistance, of the three plates, C, B and E, for example, then the resistances, 5 and 2, become cut out of the circuit, and a resistance of 3 only remains in circuit; thus by a proper union of the plates any resistance from 0 to 10 can be obtained. The metallic connections are effected by bands of metal fixed around the circumference of the combining cylinder (fig. 2), the development of which is shown by fig. 3.

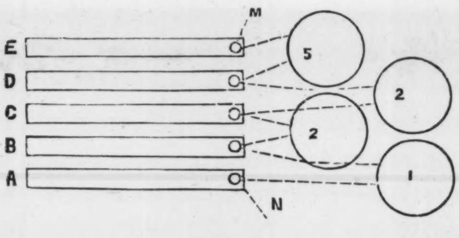
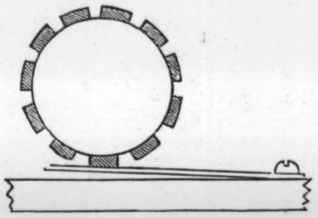


Fig. 1.

The five plates of fig. 1 are formed of five springs which press together on the connecting plates of the cylinder. It can easily be seen that the lengths and the positions of the metal strips are arranged so as to introduce in the circuit those bobbins the sum of whose resistances forms the series of numbers 0 to 10. The cylinder, it is evident, is made of an insulating material, wood or ebonite. The plates, A, B, C, D, E, are fixed at one extremity and have sufficient elasticity at their free ends to allow of the rotation of the cylinder, and of the various strips of metal being brought into the eleven different positions which they can take up.

Fig. 2.



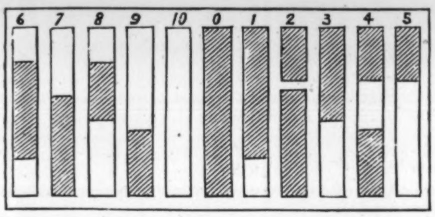


Fig. 3.

The "ten" and "hundred" cylinders are arranged in the same way as that for the "units," and the circuits, M, N, of the three cylinders are alike. The cylinders can be placed in a box arranged like a Wheatstone bridge, and furnished with proportional branches. The same arrangement of cylinders can be equally well applied to the grouping of condensers.—*Annales Télégraphiques.*

THE ELECTRIC LIGHTING BILL.

In the House of Lords on Thursday, August 3rd,

Lord Sudeley moved the second reading of the Electric Lighting Bill. The public are by this time so familiar with this measure that it will not be necessary to repeat the noble lord's observations at any great length. He pointed out the rapid and extensive growth of electric lighting in recent years, and the necessity for legislating upon the subject in such a way as to prevent the creation of such monopolies as those of gas and water—not always to the benefit of the public. He recited the leading provisions of the bill as it left the other House, and related the proceedings both of the recent Committee and of that in 1879. In support of the licences provision, he argued that the necessity of companies going before Parliament and being prepared for an outlay at once of £10,000 or £12,000 would practically retard the development of electric lighting to a serious extent, whereas the proposed system of temporary licences would be both simple and cheap, and therefore of great advantage to the community at large. The objections of the gas companies he dismissed with the remark that they naturally did not like an innovation which threatened their interests, although they had no real legal monopoly in the supply of light; and in conclusion he promised that the Board of Trade, not desiring to hamper the operations of electric companies, would be ready to modify any terms that might be found too hard.

Lord Emly did not advance any obstacles to the bill, but he regretted that it had come up so late that it could hardly receive adequate consideration. He likewise regarded the case of the gas companies lightly, but he expressed a fear lest the clause (27) which would enable an early purchase by local authorities might deter people from entering upon undertakings, especially the system being still largely experimental, could hardly yield any return in less than fifteen years, when undertakings could be bought up without compensation.

The Earl of Crawford and Balcarres, who, as Lord Lindsay, sat on the Committee of 1879, also objected to the 27th clause, pointing out that although a fair price would be given for an undertaking, yet plant and machinery would be depreciated by something like 50 per cent., which would, of course, be so much loss to the original company. For that reason he feared the purchasing powers would be a serious hindrance.

The Earl of Camperdown, on the other hand, supported the clause, observing that the great object was to prevent the creation of large monopolies which might prove prejudicial to the public interest. Nothing in the nature of compensation would take place, and tramway companies were content to take leases for 15 or 21 years without insisting on terms for future profits.

Earl Cairns, on the contrary, urged that there were few precedents for this provision, and as electric lighting was still in its infancy, it must be encouraged by greater inducements than this bill offered. No matter what expense the original company went to for plant and machinery, the whole concern was to be bought up at what might prove to be only the value of old metal. No impediment ought to be placed in the way of that science being developed, and under the circumstances he suggested that while the bill might be proceeded with, this particular provision should be postponed to next session for further consideration.

The Earl of Kimberley pointed out in regard to the question whether the bill offered sufficient inducements, that there was no practical experience at present to guide the legislature and it was not possible to fix any precise limits as to profits. Gas companies had been limited as to profits, but in this case there was no such limit. If it should seem desirable to extend the powers of electric lighting companies, that could be done; but at present the matter would only be of an experimental character, and it was important to prevent the creation of costly monopolies.

The Marquis of Salisbury did not think the terms offered to companies was as fair as they might be, and in the interest of the public the system ought to be developed as rapidly as possible.

The Lord Chancellor deprecated the proposal to defer the purchase clause, as it was important that intending companies should know what the terms of purchase would be at once. The Government had no desire to discourage the development of the system, but they were anxious not to repeat the fatal errors committed years ago in the case of gas and water companies. All the proposed companies had expressed their satisfaction with the terms in the bill, and one company alone was expected to make ninety-five applications under the bill. He believed fifteen years would enable the companies to make a tolerably substantial profit.

After some remarks by Lord Truro, Earl Fortescue, and Lord Ellenborough, the bill was read a second time.

On the 8th instant, on the order of the day for going into Committee on this bill,

Lord Sudeley said before this bill went into committee it would be to the convenience of their lordships if he stated at once that since the second reading of the bill the Board of Trade had very carefully considered again the objections raised by the electric companies on Clause 3 and Clause 27. The Board of Trade had always felt it was difficult to say exactly what was the precise number of years which should be given to a licence, and after what exact number of years the local authorities should have power to purchase. The object had been to fix the shortest time for the existence of the monopoly that would be consistent with sufficient inducement for the investment of the necessary capital. After hearing the difficulties which the electric companies felt, mainly on the ground that the installations would be on a far larger scale than was at first thought practicable, the Board of Trade had thought that in the interests of the general public the term of licence should be extended to seven years, and the term of purchase to 21 years. The exact amendments would be as proposed by the noble earl (Lord Crawford). It was understood that this would meet all the objections of the electric light companies, and it was far better in the opinion of the Board of Trade that the question should be settled permanently than be allowed to be raised at some future time. The amendment about to be moved by the noble lord (Lord Bramwell) was totally inconsistent with this arrangement, and altered the terms of purchase and could not be agreed to.

Their lordships then went into Committee on the bill.

In clause 3, on the motion of the Earl of Crawford, an amendment was adopted extending the period of a Board of Trade licence from five to seven years.

In clause 27, the Earl of Crawford moved that the period after which the local authorities may purchase the undertaking of electric lighting companies should be extended from 15 to 21 years, and afterwards at every subsequent period of seven instead of five years.

The motion was agreed to, and the bill, as amended, passed through Committee.

THE ELECTRIC LIGHTING OF THE COMPTOIR D'ESCOMPTE BY BICHROMATE BATTERIES ON THE JARRIANT AND GRENET SYSTEM.

Can batteries charged with liquids be employed for electric lighting on a considerable scale without the expense involved in their use being out of all proportion to the result obtained? All the experiments made up to the present have given a negative response, but this has not prevented inventors from continuing their researches in this direction, and in the ardour of their convictions these *savants* have persuaded capitalists and financiers to make the necessary sacrifice in order to give their ideas a practical shape, and to bring them within the domain of accomplished facts. Considered entirely from a special point of view, the installation which we are about to describe presents an interest quite unique, and is a witness of a confidence which we are far from sharing in. However, we shall content ourselves at present with simply describing what has been done, and what is about to be done, reserving for a future date, when the cost of the system is known, an expression of the economic advantages and the disadvantages of the installation.

The Comptoir d'Escompte is a magnificent building in Paris, and in which the able architect, M. Corrozer, has taken advantage of the most recent advances made in science and industry. The records deposited in the Comptoir represent a considerable sum, and in the interest of their preservation in order to diminish as much as possible the chances of fire, the suppression of gas lighting and the introduction of electric lighting was decided upon. By way of precaution it was determined not to employ a steam-engine in the base of the establishment, and the installation of this machine in the neighbourhood presented insurmountable difficulties. It was necessary, therefore, to have recourse to batteries, and in order to avoid obnoxious fumes it was decided to employ the bichromate form. The pattern settled on by MM. Grenet and Jarriant does not differ in principle from the aerated form devised by M. Grenet in 1857 and constructed at this date with the object of applying it to chirurgical operations. At the Comptoir d'Escompte bichromate of soda was substituted for bichromate of potash, the cost of the latter being the higher of the two, aeration is effected mechanically instead of by a hand bellows, and all the arrangements of detail are combined in order to facilitate the daily use of such a large number of elements, for the complete installation does not include less than 60 batteries of 48 elements each, or 2,880 elements in all. One half of the batteries is already in use, the other half is also actually set up ready to be brought into use in October next. When fully at work the electric lighting of the Comptoir d'Escompte will represent an electric power of 50 horses.

We will now describe the installation. Each battery is composed of 48 zinc-carbon elements (with a single liquid) joined up in series. The solution is made of 75 kilogrammes of bichromate of soda and of 150 kilogrammes of sulphuric acid for each cubic metre of liquid. Each element is formed of a square ebonite cell, provided with an overflow pipe to draw off the solution. The positive pole is formed by four rectangular plates of carbon arranged parallel to the sides of the cell; the negative pole consists of a little cup of ebonite containing mercury, in the centre of which is fixed a metallic stalk. Around this stalk are arranged four or six zinc rods plunged into the mercury; this insures good contact and also a perfect amalgamation of the zincs; the cylinders of zinc are held vertically around the stalk by means of india-rubber rings. The carbons are fixed in the cells, whilst all the zincs are suspended across, which allows of their being withdrawn or plunged into the solution; the active surface of the zinc can thus be varied, and the internal resistance adjusted according to the current required. The connection of a carbon to a zinc is effected by means of a little metallic tube fixed to the carbon and half filled with mercury, into which is plunged a stalk fixed to the zinc; this allows of the vertical withdrawal of the zincs without interrupting the connection of the elements. The solution of bichromate of soda is prepared beforehand in large quantities at the workshop and is pumped into large reservoirs at the top of the building. From there it is brought below to each battery by a special pipe service—very well arranged although rather complicated—provided with taps of ebonite and pipes of india-rubber.

The fresh liquid can be used three times over. The first time it flows at the rate of 20 litres per hour, and through the battery of 48 elements; the second time at the rate of 30 litres, and the third time at the rate of 40 litres. By adding a little of the fresh liquid it can be used over for a fourth time. When thus used it drains through at the rate of 60 litres per hour per battery; after which the liquid goes through a process of regeneration. MM. Jarriant and Grenet profess to be in possession of an economical process for the regeneration of the liquids, a process which allows of the separation of the chrome and the zinc from the alkaline sulphate, by a new method. This process, which is no longer a secret, being patented by MM. Jarriant and

Grenet, appears to us to be decidedly complicated. The following is a rapid enumeration of the manipulations necessary to effect the regeneration of the products :—

1st. The saturation of the excess of sulphuric acid by carbonate of lime ; the precipitation of the sulphate of lime, of the oxide of chrome, and of the carbonate of zinc. The liquor which remains contains alkaline sulphate.

2nd. The decantation, concentration, and crystallisation of the alkaline sulphate.

3rd. The separation of the carbonate of zinc from the oxide of chrome, and of the sulphate of lime, by a certain quantity of sulphuric acid, which is calculated exactly to transform the carbonate of zinc into sulphate of zinc. The liquor which remains contains sulphate of zinc, which is concentrated after decantation for crystallisation.

4th. The desiccation, pulverisation, and mixing of the sulphate of lime and oxide of chrome with quicklime and the alkaline carbonate.

5th. The calcination of the above mixture on the hearth of a reverberatory furnace and the extraction of the chromate by *known processes*.

We see that the generation of the products is by no means a simple operation, involving, as it does, five processes, not counting the *known processes*, and the carriage of the liquids from the Comptoir to the workshop, and from the workshop to the Comptoir.

Let us now return to the batteries. We can see that the overflow pipe serves to maintain the level constant in the elements in proportion as they are filled with fresh liquid ; this circulation of the liquid serves in a certain degree to keep the current constant, a constancy still more preserved by an aeration produced in each element by means of two tubes of ebonite, which plunge into the bottom of the liquid. In order to obtain the air necessary for the aeration without special expense, advantage is taken of the compressed air used for the pneumatic transmission of messages between the various offices of the Comptoir.

Under ordinary conditions, the volume of air furnished to each battery is about three cubic metres per hour, under a pressure equal to the height of the liquid in the elements, or about 15 to 20 centimetres of water.

The installation is completed by a supply of water for cleaning the elements, and a double sink for the discharge ; one of the sinks is employed for remixing the liquid for charging the batteries, the other holds the water for washing the elements and conducts it into the sewers.

The negative pole of each battery is connected to a common lead wire, the positive pole is joined to a commutator which has fifty bars. The feeding apparatus is also connected to a common negative lead wire, and the positive poles are attached to the same commutator ; the batteries occupy the horizontal bars and the lighting apparatus the vertical ones. We only require, therefore, to place a peg where two given bands meet in order to establish communication between a battery of a given number and a given series of lighting apparatus. Either the Swan incandescent lamps or the arc lamps of Siemens, Gravier, &c., are used as occasion requires. Each battery of 48 elements in series has an electromotive force of 82 volts, and can give as much as 24 ampères on a short circuit. We see by these figures that a single battery is sufficient to feed a number of incandescent lamps or a voltaic arc with 10 carbons of 10 millimetres, which works very well with 10 ampères. We can besides group several batteries in tension or in quantity as occasion may require, in order to supply more powerful arc light or a larger number of incandescent lamps ; it is with this object and also for the purpose of having a few reserve batteries that the commutator has only 50 positions, although the complete installation should have 60 batteries.

The employment of a distinct wire for each lamp, and of a wire for each battery, the negative being in common, constitutes rather a serious expense at the first installation, but it has the advantage of rendering the apparatus, lamps, and batteries absolutely independent of one another. In case of accident it is easy to localise it and repair it, and thus the accident is never very serious. An indicating table, arranged opposite the Swiss commutator, enables the lighting of any given hall to be regulated from a distance ; the workman charged with the superintendence of it knows which are the right batteries to work, and has only to place the pegs. Besides, the lamps can be lit or extinguished at will by commutators arranged in the hall, when communication is established between a battery and a given circuit by means of the Swiss commutator.

Such is the principle of MM. Jarriant and Grenet's installation of bichromate batteries for the lighting by electricity of the Comptoir.

The future will throw some light on the economic view of the question, concerning which we have as yet very vague ideas. This point will decide the future of the installation ; but whatever fate may be reserved for it, it was no less interesting to describe the general outline of an installation in which for the first time for industrial purposes and practical application an electrical energy of fifty horse-power has been produced by the employment of liquid batteries.

CORRESPONDENCE.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith.

Correspondence should arrive not later than Tuesday morning if it is desired to appear in the following number.

A MAGNETOMETER FOR THE DETERMINATION OF THE POLE STRENGTH OF MAGNETS.

To the Editors of The Electrical Review.

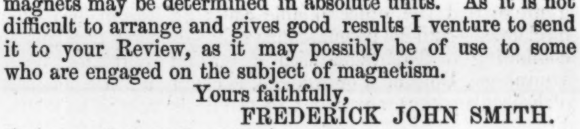
Sirs,—While occupied in the study of magnetism I have devised a little instrument by which the pole strength of magnets may be determined in absolute units. As it is not difficult to arrange and gives good results I venture to send it to your Review, as it may possibly be of use to some who are engaged on the subject of magnetism.

Yours faithfully,
FREDERICK JOHN SMITH.

Taunton, *July 28th*, 1882.

Description.

A magnet of rectangular shape, S C N, having a brass counter weight, D C, equal in length to C N, is attached to a torsion wire, A B, stretched between two pillars ; it is furnished with a mirror scale and lamp, F H. The magnet is made of rectangular form in order that the south pole may be placed in the axis of the wire, and thus out of the influence of side pull of the magnet, N′ S′. By a milled head at A different amounts of torsion can be given to the wire. To use the instrument the magnet, N′ S′, is removed, and the magnet is placed in a horizontal position, and the scale reading taken. A known weight, W, is now placed at D, and the new scale reading recorded. The weight is now removed, and the magnet, N′ S′, of equal pole strength is slowly raised under the N pole of the rectangular magnet until the same reading on the scale is obtained as when the weight was on, thus the repulsion of the two equal poles is equal to the effect of the weight, W. (No great difficulty is found in making magnets of equal pole strength by a peculiar process.)



Now, we know that the force, *f*, acting between magnetic poles it stated by the formula

$$f = \frac{s \times s'}{d^2}$$

where s s′ denote pole strength and *d* distance between them in this instrument, $s = s'$, so the formula may be written

$$f = \frac{s^2}{d^2}$$

and *w g* can be written for *f* where *w* denotes the numerical value of the weight and g = gravity force ; from this S is at once known ; the weights are part of the gramme, and the distance, d, is measured in centimetres. The rectangular magnet has been used by me to construct a virtually one-pole magnet some years ago. When the strength of one-pole has been determined other magnets and solenoids can at once be compared with it, the magnet, N′ S′, is raised into position by a micrometer screw.

THE RIVAL TELEPHONE COMPANIES.

To the Editors of The Electrical Review.

Sirs,—The public has no doubt heard with no unmixed pleasure the announcement by "The London and Globe Telephone and Maintenance Company (Limited), that it intends to construct and maintain and provide telephone lines and exchanges on more advantageous terms than those of existing companies, so as to place the telephone within reach of all classes of society." The United Telephone Company has lost no time, however, in bringing to the notice of the public several judicial facts bearing upon certain of the patents advertised as part of the purchase to be made by the new company for the moderate sum of £130,000. The public, however, are too familiar with the preposterous claims heretofore set up by the United Telephone Company to give credence to all that company may publish. In this case, however, it would appear that Mr. Justice Fry did decide that the Hunnings' transmitter, "having the combination of a diaphragm with a tension regulator," was an infringement of Edison's patent, which patent, however, Mr. Justice Fry felt compelled by the evidence before him to declare to be void, because of a claim in it not justified by the provisional specification.

Now, however, the fiat of the Attorney-General has been granted, and the objectionable claim of Edison has been disclaimed—and his patent stands valid—and any transmitter combining a diaphragm with a tension regulator, be it Hunnings', Dolbear's, or Ander's, is clearly an infringement of Edison's patent, according to the decision of Mr. Justice Fry.

When schemes, for which the too easily gulled British public are asked to subscribe, embrace the development of scientific discussion, it might be advisable for it to consult scientific publications instead of the financial newspapers of the day.

JUSTICE.

10th August, 1882.

MULTIPLE TELEPHONE SIGNALLING.

To the Editors of The Electrical Review.

Sirs,—I beg to offer a few remarks on the article describing Mr. Kettell's individual telephone call and signal, in the number for July 15th. It is a difficult task to give a detailed description of such an instrument, and great credit is due for the lucid manner in which the working was explained.

"The proof of the pudding is the eating." I therefore speak with all deference to the statement that the system has been in practical use for over a year and a half, and has proved a perfect success, but it would appear to me that the following difficulties would seriously affect the prospect of its general introduction into this country :—

1. Each subscriber could interrupt and overhear the conversation of any other subscriber on the same line.

2. Any mischievous person might without fear of detection, ring up all the subscribers on the line by pressing his button when he observes the clockwork going.

3. The subscriber who first calls is kept waiting with his telephone to his ear until the exchange answers him, and after that until the attention of the person he wishes to speak to is gained. This is very wearisome compared to the separate line system, under which the subscriber simply rings up the exchange, and having given the number of the firm he requires, may leave the instrument until his bell is rung again as a warning that the person he asked for is in readiness to speak.

4. No. 1 rings up the exchange, and in doing so sets all the discs to "line occupied"; he says he wants to speak to No. 5 (who is on the same line). How is the attention of the last-named to be obtained ? Must not the exchange go through the process of clearing the line, and then ring him up by pressing the button, p, as in other cases ?

5. The amount of work thrown on the operators would appear to be very heavy ; they would not only have to wait until the clock ceased running before connecting two lines together, but would have to send clearing currents along each of them after the expiration of the three minutes allowed for speaking.

One man could not, I suppose, do the switching for more than thirty subscribers (six lines of five stations each).

6. In the event of the person who is being called not attending to the first ring of his bell, a clearing current would have to be sent from the exchange along the line, and the process of ringing him gone through again, during which time the subscriber who first called would be impatiently waiting with his telephone to his ear.

Taking the difficulties above enumerated into consideration and the thousand and one peculiar incidents which occur in the use of exchange lines, I do not think that we have yet arrived at a satisfactory solution of the problem how to connect several subscribers up to an exchange on one wire, and at the same time give them an efficient service.

The best arrangement I have yet seen for the purpose was that designed by Messrs. Brown & Saunders, and shown at the recent Crystal Palace Exhibition. A description of it was given in one or two of the scientific papers. The following is an extract from one of these, from which it will be seen that very important results are obtained :—

"The object of this apparatus is to place a number (say 11) telephonic subscribers in series on one line in such manner that either one may call up and speak to another without disturbing the remainder and without the possibility of any of the remaining subscribers either tapping or overhearing the conversation or of interrupting by ringing until the caller clears the line.

"An automatic arrangement is also provided which insures that the caller shall not neglect to so clear the line when he has finished speaking."

The telephone industries are now assuming very large proportions ; a great variety of opinion exists as to the best form of switch boards, subscribers, instruments, transmitters, line work, &c. It appears to me at once strange and regrettable that in this country telephonists have not hitherto exchanged views and discussed these questions through the medium of a paper. I am, Sirs,

Yours faithfully,

WM. L. MADGEN.

Belfast, *August 5th*, 1882.

ELECTRIC LIGHTING.

To the Editors of The Electrical Review.

Gentlemen,—In Mr. Humphreys' letter to your journal of the 5th inst., making, no doubt, allowable excuses for the Brush failures, he says, "In this the first large attempt ever made at street lighting in this country." Now, "fair play is a jewel," and long before "Brush" was ever heard of the "Jablochkoff" system lit the grandest thoroughfare in Europe, and has done so for nearly four years, and never had an extinction, until for one night lately, by the piston rod of the engine breaking.

Faithfully yours,

R. SPEAR BEGBIE.

August 5th, 1882.

THE CITY AND GUILDS OF LONDON INSTITUTE TECHNOLOGICAL EXAMINATION.

To the Editors of The Electrical Review.

Sirs,—In "Fareham's" interesting and suggestive letter in your last issue, on the recent technological examination, held under the auspices of the City and Guilds of London Institute, he mentions what appears to be an anomaly in the result of that examination. The particulars which he gives of this case tally exactly with those known to me, and if I am right in believing they refer to the same circumstances, perhaps, as one better acquainted with the actual facts, I may be permitted to correct the erroneous opinion he has formed of them, and which he may have led your readers to share. Your correspondent is quite wrong in stating a clerk of only six months' study managed to secure an honours' "pass," while another of six years' theoretical and practical experience was plucked, and using this as an argument to show the weakness of the present examinational system. The truth is, the successful clerk has had a few years of study, and it has not been all theoretical, though he has never acted as a "test" officer. "Fareham" is not very successful in explaining the cause of the failure of one so deserving of honours. Is it conceivable that one who five years ago secured a first class certificate in electricity and magnetism could have failed to pass in honours through inability to express himself? But, whatever may be the true reason, it is scarcely fair to make use of the result to cast reflections on the quality of the knowledge possessed by a successful candidate, and to question (even though indirectly) his right to an honour which he has striven hard for.

"Fareham" assures us this "anomaly" is by no means an isolated one, but I am inclined to think that if the others were examined into they would admit of a more creditable explanation. I do not believe that any one, however excellently crammed or coached, could pass ordinary or honours in telegraphy without a considerable practical knowledge of the subject.

ABA.

August 7th, 1882.

To the Editors of The Electrical Review.

Sirs,—The keynote of the annual wail from disappointed teachers has been struck by your correspondent "Fareham," in a letter which is valuable, so far as the tabulation of the examination results and his remarks thereupon go, but which, in other respects, has not a very logical connection between its premises and conclusions.

A quotation is made from an address of Colonel Webber, in which instruction in the workshop and laboratory, and the hand-in-hand march of *theory* and *practice* is advocated; and your correspondent goes on to state, that such a course cannot be gone through at the City and Guilds classes so long as the present system of examination continues, so long as students gain prizes, and teachers grants, by mere "cram" knowledge. I venture to think this charge against the City and Guilds examinations is quite unfounded. The questions set at the May examination seem to have been specially directed against "cram," and no student who had not combined a practical, with a theoretical study of the subject, could have answered them satisfactorily.

To support his case, "Fareham" cites an instance where a student, who has devoted five years of his time to the study of technical telegraphy, and who discharges from time to time the duties of a testing officer, was plucked, while a six months' (?) student gained an honour's place. "There is but one explanation of such an anomaly," adds your correspondent, "and it is the failure of the five years' student to express himself on paper."

Practical examinations are, therefore, demanded. Without discussing whether a student who fails at a written examination would be more successful at an oral one, I would point out that this "anomaly" is singularly at variance with the position taken up by "Fareham," proving, as it does, that there may be too much *practice* and too little *theory*. There are many very good testing officers who carry out their duties with care and exactitude, and with a certain amount of "knowingness" to boot, whose real knowledge of the principles of testing never rises above the rule of thumb; and probably the five years' student's relationship to this class of technical officers may account for his inability to express himself on paper.

Undoubtedly a great cause of failure at these examinations is the temptation which first year's students have to compete in the honours grade. This is due to the practice of carrying on the teaching for both grades at the same time, there being no distinction between ordinary and honours subjects in the syllabus supplied to teachers. Were the City and Guilds Institute to take an example from the Science and Art Department in this respect, and issue a syllabus stating clearly and fully the ground to be covered in each grade, teachers and students would be alike benefited. The teaching would then be thorough and definite, the class being necessarily elementary or advanced. It would not then be needful to hurry over the entire subject in one short session as at present, and students would no longer have it in their option to bring discredit on themselves and their teachers by aspiring beyond their qualifications.

Yours truly,

MAGA.

THE UNITED TELEPHONE COMPANY.

To the Editors of The Electrical Review.

Dear Sirs,—I venture to send to you a few comments on the reports made by the directors of the United Telephone Company (Limited) to the two general meetings of their shareholders, held respectively on August 9th, 1881, and on August 1st, 1882.

The nominal capital of this company is £500,000, of which it appears that £400,000 had been paid in for shares prior to August 9th, 1881, the date of the first general meeting. In that report it was stated by the chairman that in the months of May, June, and July, 1880, there were 609 subscribers; in August, September, and October, 707; and in December, January, and February, 820; and on August 9th, 1,052. The total receipts from all sources were £20,644, and the working expenses were £20,273, thus showing a surplus of £371 over and above working expenses, with which a dividend of one-twelfth of one per cent. might have been paid on the £400,000 paid-up capital—a result which could not have been very satisfactory to the 600 shareholders. But the Lancashire and Cheshire Telephone Company fortunately arrived in time to assuage their grief, and a bonus of 10s. per share upon the issued shares of the United Telephone Company was paid out of the sum of £50,000 cash received from the Lancashire and Cheshire Telephone Company, leaving a balance of £10,000 to be carried to the reserve fund, applicable to the general purposes of the company. The United Telephone Company received also from the Lancashire and Cheshire Telephone Company 50,000 of their fully paid-up shares of £1 each.

At that meeting the chairman said, "I don't want to bother you with figures, but here are some remarkable statistics compiled by our auditors, showing the increase in the number of our subscribers, and, above all, the decrease of the expenses." The few figures which the chairman did put forth must have bothered greatly the shareholders, as those figures gave to the shareholders the not welcome information that the company had earned only £371 during the year, notwithstanding the "remarkable statistics compiled by the auditors." The one great fact which stands forth conspicuously in that report is that the United Telephone Company, with 1,052 subscribers to their London exchange, earned only enough to cover their working expenses.

Now I turn to the report submitted on the 1st inst. to the general meeting of the shareholders.

The receipts from all sources for the year have been £42,624, and the working expenses £21,050; the balance net revenue, £21,945, from which a dividend of 5 per cent. was paid on £400,000 paid-up capital, leaving a balance of £1,945 to be carried forward.

It is no doubt gratifying to the shareholders that their telephone exchange has paid them a dividend of 5 per cent., less income-tax.

Is it possible that the 600 shareholders who have paid £400,000 into this company's coffers can be satisfied with a dividend of 5 per cent. when they consider that Bell's patent will expire in eight years, in December, 1890, and Edison's patent in July, 1891, for which the company have paid fabulous sums of money; to which must be added the money paid for Crossley and Blake's patents, making a total of nearly £300,000, which large sum of money will have entirely disappeared in nine years. No mention is made in either of the reports of any provision for a sinking fund to make good to the shareholders the capital sunk in patents. Perhaps they are satisfied with the *patent* sinking fund they have. The report announces the formation of two new companies affiliated to the parent company, viz., the Telephone Company of Ireland, nominal capital £200,000, of which the United Telephone Company receives 87,500 shares of £1, and a payment of annual royalties on each instrument used; the other company is the Western Counties and South Wales Telephone Company, nominal capital

£275,000, of which the United Telephone Company receives 125,000 shares of £1, and annual royalties on each instrument used. If these companies can earn dividends of course the United Telephone Company will receive its share of them. That the prospect is good may be doubted, when the prolific parent company's exchange in London, with its 4,000,000 population, could only pay its expenses during the first year, and only 5 per cent. for its second year.

The abnormal high price of the shares of this company is an enigma.

The statement made by the chairman at the first general meeting that the United Telephone Company had secured in its own hands "all the patents of value in this country, and that it has the *monopoly* of the telephone in the United Kingdom," no doubt has had its effect upon the general public, who, believing in those (I may say) preposterous claims, fancy they hold a monopoly of telephony in the United Kingdom. Even in the report submitted on the 1st inst. that illusion is attempted to be kept up by the remarks of the chairman, that "if any persons do obtain a licence from the Postmaster-General they will first have to obtain proper instruments to carry out the business, which I think at this moment is rather *a doubtful enterprise on their part*."

It is possible—aye, probable—that the general public will sooner or later be convinced that this company's security in a monopoly is a myth, and will learn to its cost that the fancied security in a monopoly expressed by their chairman resembles closely the fancied security of the ostrich, which sapient bird hides its head and believes its pursuers cannot see it because it has concealed its own eyes.

The telephone is an useful instrument, and will become a necessary one so soon as instruments can be procured at a reasonable price, which desirable end cannot be obtained from a company which has paid hundreds of thousands of pounds for a fancied monopoly.

COMMON SENSE.

London, *August 9th*, 1882.

NOTES.

ERRATUM.—ELECTRICAL REVIEW.—In the letter of Prof. Silvanus Thompson, headed "The Telephone," in our issue of August 5, 1882, p. 87, col. 1, line 12, for "1863" read "1861."

DANGER FROM ELECTRIC LIGHTING.—We read in the daily press that an accident, attended with fatal results, occurred on Sunday evening, in the Tuileries Gardens, in Paris, during the display of fireworks. Two men, in attempting to climb over the railing, caught hold of the electric wire used for the illumination of the grounds, and were struck dead on the spot, all efforts to restore them to life proving ineffectual.

OPPOSITION TO A PATENT FOR IMPROVEMENTS IN DYNAMO-ELECTRIC MACHINES.—In the opposition to the application by Mr. W. H. Akester, of the Universal Electric Light Company, Limited, for letters-patent for improvements in dynamo-electric machines, the Attorney-General heard counsel for parties on Saturday last. On account of the allegations and counter-allegations in the declarations, while permitting the patent to proceed, he declined to allow the applicant costs. In reply to counsel on both sides, the Attorney-General stated that as his tribunal was one before which parties could not be cross-examined upon oath, he should for that reason allow the patent to proceed, leaving the applicant to his remedy in open court. Application for provisional protection was made and granted on 17th December, 1881 (No. 5525), and on notice to proceed being given, opposition was lodged against the patent being sealed by Mr. David Graham, electrical engineer to the Railway Appliances and Electric Company (Limited). The grounds of opposition were: (1) That the patent was an infringement of a patent which Mr. Graham had previously acquired—this ground was afterwards abandoned; and (2) that the invention was that of Mr. Rankin Kennedy, another *employé* of the company, and not the invention of Mr. Akester, while the latter maintained that the invention was exclusively his own. The application and opposition have been fought keenly for several months past, so great is the intrinsic value of the invention believed to be, many declarations and exhibits having been made on both sides. The matter is by no means finally disposed of, and Mr. Kennedy has upon the advice of his counsel instructed his agent to oppose the applications before the Lord Chancellor.

EXTINGUISHING THE ELECTRIC LIGHT.—For maliciously extinguishing the electric light in St. Enoch Station, Glasgow, Peter Smith, who had been an *employé* of the Glasgow and South Western Railway Company, was fined two guineas, with the alternative of twenty days' imprisonment, at the Central Police Court of Glasgow on Monday last.

THE ELECTRIC LIGHT AT EDINBURGH.—After the unfortunate failure of the electric light as an Edinburgh street illuminant, it is gratifying to learn that the installation made twelve months ago at the Waverley station of the North British Railway Company has been so successful that the company has decided that "the light of the future" shall shed its rays not only over the main portion of the station, but even unto its outermost platforms.

ELECTRIC LIGHTING IN THE ROYAL AQUARIUM.—We understand that a prize of 100 guineas is to be offered for the best and most durable system of incandescent electric lighting in the forthcoming exhibition, to be held at the Royal Aquarium. Each competitor is to be limited to 100 lamps, and these are to be kept in action during the whole time that the exhibition is open. Tests on each system will also be taken at intervals. We believe that it will be stipulated that when each installation is fairly started no part of it shall be subject to any additions or alterations unless duly reported.

THE WINTER ELECTRICAL EXHIBITION AT THE ROYAL AQUARIUM.—Doubtless most of our readers are already acquainted with the contents of the prospectus issued by the directors of the Royal Aquarium. The space at command being limited, the installations of individual exhibitors will be restricted, so that all may be placed upon an equal footing. Attention will be concentrated more particularly on electrical matters which have hitherto been imperfectly touched upon. Copies of the prospectus, together with a lithographed plan of the Aquarium building, may be obtained on application to Mr. Will. D. Gooch, the engineer to the exhibition.

ELECTRIC LIGHTING IN LIVERPOOL.—The Pilsen, Joel, and General Electric Light Company, Limited, on the evening of Wednesday, the 2nd inst., lighted the extensive music warehouse of Mr. W. Lea, in Church Street. Four Pilsen arc lamps, each giving a stated light of 2,000 candle-power were employed, the current being produced by a Schuckert 4-light dynamo-electric machine, driven by a five horse-power Ransome's engine. This and the machine were placed in School Lane, and the length of cable required was about 500 yards. We believe the installation is under the control of Messrs. Woodhouse and Rawson, electrical engineers and contractors, the work however being carried out under the direction of Mr. R. H. Newington. A large number of ladies and gentlemen (including the Lord Mayor, the Lady Mayoress, and several councillors), were present at the invitation of the chairman and directors of the company. These were received by Mr. Beattie, the company's London representative, and Mr. Rawson. We understand that the inauguration passed off in a most successful way, and great satisfaction was expressed by all present at the effect produced by the Pilsen light.

THE ELECTRIC LIGHT AT PAISLEY.—The mansion of Mr. Archibald Coats, at Woodside, Paisley, has now been fitted throughout by the Edison Electric Light Company with the electric light. The total number of lamps fitted up is 200.

THE ELECTRIC LIGHTING BILL.—Two letters in the *Times* of the 8th inst. on the above subject are worthy the attention of all connected with the electric lighting interests. One is from Mr. Moulton, Q.C., and is written in a similar strain to that of Sir Frederick Bramwell, published in the same paper a short time previously. The second is from Mr. Arnold White, the Secretary to the Edison Electric Light Company.

Electric Lighting in America.—The Hotel Vendome in Boston has within the last few days been provided with sixty of the Edison Company's incandescent lights, each having a power of sixteen candles. Mr. William W. Munroe, the Boston agent of the company, says the Edison Company now can fairly claim that it has passed its experimental age, and with its system perfect in all details is now really achieving high practical results. The incandescent light, he adds, as used by the Pemberton, Arlington, Merrimac, and Worrumbo mills, and by numerous prominent business houses throughout New England, is daily proving that it is superior to gas in all ways, while at the same time more economical. We read also that by September one thousand houses in New York will be supplied with the incandescent light in Edison's first district. Since June 1st, according to an American contemporary, Mr. Edison has filed fifty-one applications for electric lighting patents, and that he has now a grand total of 109 patents in this subject alone. Edison lamps have been used for some months in the offices of the Philadelphia *Ledger*, and the plant is now being doubled. The *Record* has also ordered an installation. The United States Illuminating Company is also apparently doing a considerable amount of business. Machines and lamps under the Maxim, Weston, and Farmer patents are manufactured for the company by the United States Electric Lighting Company, and not less than 160 miles of conducting wires for arc lights have been supplied.

Over Five Thousand Electric Lights in One Building.—The Mills Building, Wall and Broad Street, says the *Scientific American*, has been wired for 5,588 Edison lamps. As this is the largest enterprise of the kind ever undertaken the details may prove interesting. The conductors consists of 1,650 feet of Edison's patent electric tubes, 628 feet of lead pipe containing taped wires thoroughly insulated, 23,658 feet of zinc tubes, 75,909 feet of wire conductors, and 24,162 feet of wooded receptacles, placed between the floors, to hold the system of distributed wires. The total amount of wires used was 3,774 lb., besides 48 vertical main cut-outs, and 253 division cut-outs.

The Telegraph and Electric Light in Egypt.—The mounted portions of the telegraph troop Royal Engineers, consisting of about seven officers, 184 non-commissioned officers and men, and 65 horses, with two field telegraph equipments complete, and the field pack of the Royal Engineers, including one officer, 33 non-commissioned officers and men, and 26 horses, under the command of Major Sir A. Mackworth, marched from Aldershot on Saturday last, *en route* to the South-West India Docks, London, where they will embark to-morrow in the steamer *Oxenholme* for conveyance to the East.

The telegraph steamer *John Pender*, which arrived at Alexandria with a sufficient supply of cable on board for the projected line between Suez, Port Said, and Alexandria, was recently engaged in important work for the Eastern Telegraph Company between Lisbon and Land's End. Immediately on the decision of the Government, and from the urgency of the case, she was ordered to Alexandria.

A portable steam-engine has just come out for working an electric machine.

Izzet Effendi, Director of the Telegraphs, sent a staff of *employés* on the 3rd inst. to lay and open a cable between Jeddah and Souakim.

The *Superb* used her electric light on the night of the 9th inst. from where she lies, off Count Zizinia's house, but whether it was an advantage or otherwise is an open question. From the distance she had to throw the rays it was impossible for those on board to use the light so as to be of the greatest assistance to our sentries. The officer in charge of the picket said that several times the electric light was thrown on his own men, who thus were themselves exposed to view, and at the same time were unable to penetrate the darkness beyond. This is manifestly turning a valuable appliance into a source of danger, and it shows the inutility and even peril of using the electric light indiscriminately. Arrangements have been completed for throwing the electric light over the enemy's lines from Ramleh.

Movement for Cheaper Telegrams in Australia.—A number of gentlemen interested in the various industries of the Northern Territory of South Australia recently met to consider the best means for securing a reduction in the cost of telegrams between Adelaide and Port Darwin. After a brief discussion it was decided to bring the matter before the South Australian Government, and the better to attain this object a memorial was prepared to be presented by a deputation to the Minister for the Northern Territories as soon as representative signatures to it are obtained. The memorial suggests that the charge for the first ten words should be reduced from tenpence to threepence.

The Cost of Telegrams.—It has been suggested that, as a step in the direction of reducing the cost of telegrams, the Post-Office should allow a message of twenty words, the answer to which is prepaid, to be sent for 1s. 6d. The idea is likely to be brought under the notice of the Postmaster-General on an early day.

The Telephone.—From Birmingham we learn of a new and useful application of the telephone. Between the offices of the Health Department and the borough hospital, three miles distant, telephone communication has been established, in order to lessen the risk of the spread of infection by friends visiting the patients. This method of ascertaining the progress of the hospital inmates is extensively taken advantage of daily.

The London and Globe Telephone and Maintenance Company.—This company has been promoted for the purpose of acquiring the telephonic inventions of Prof. Dolbear for a transmitter and receiver (the latter being already well known), and the microphone transmitter of Mr. Anders, together with switch boards, signal bells, and batteries. Included also in the purchase-money (£40,000 in cash, and £90,000 in fully paid shares of the company) is the celebrated "Hunnings" transmitter. No sooner is the prospectus issued than the United Telephone Company informs intending investors through the medium of the press that proceedings will be taken against the new company, the United Telephone Company being advised that the Dolbear, Anders, and Hunnings transmitters are all infringements of the Edison patents. The London and Globe Telephone Company, in response, invite the public to disregard the opposition of the monopolising company. We consider the new company ill advised in bringing forward the last-named transmitter (if they had others equally good), and we hope that the action taken by the United Telephone Company will not have the effect anticipated.

The New Atlantic Cable Enterprises.—In the Senate of the United States, on June 26th, 1882, Mr. Gorman asked and, by unanimous consent, obtained leave to bring in the following bill, which was read twice and referred to the Committee on Foreign Relations. On June 27th, 1882, it was reported by Mr. Windom with amendments, viz., to insert the parts printed in *italics* :—

A BILL

To encourage and promote telegraphic communication between America and Europe.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Robert Garrett, William F. Burns, and William F. Frick, of Maryland, their associates, successors, and assigns, shall have the right to construct, lay, land, and maintain a line or lines of telegraph or submarine cables on the Atlantic coast of the United States of America, to connect the American and European coasts by telegraphic lines, wires, or submarine cables: *Provided, That said company shall begin to lay said cable or cables within one year from the passage of this Act: And provided further*, That no amalgamation, union, or sale of cable interests established under this Act shall be made to any existing European or other cable companies.

Sec. 2. That any telegraphic line or cable laid be subject to the following conditions, stipulations, and reservations, to wit:

First. The Government of the United States shall be entitled to exercise and enjoy the same or similar privileges with regard to the control and use of such line or lines, or cable or cables, as there may by law, agreement, or otherwise be exercised and enjoyed by any foreign government whatever.

Secondly. Citizens of the United States shall enjoy the same privileges as to the payment of rates for the transmission of messages as are enjoyed by the citizens of the most favoured nations.

Thirdly. The transmission of despatches shall be made in the following order; First, despatches of state, under such regulations as may be agreed upon by the governments interested, the rates not to exceed those charged to individuals; secondly, despatches on telegraphic service; and thirdly, private despatches.

Fourthly. The lines of any such cables shall be kept open to the public for the daily transmission of market and commercial reports and intelligence, and all messages, despatches, and communications shall be forwarded in the order in which they are received, except as hereinbefore provided.

Fifthly. Before extending and establishing any such line or lines, or cable or cables, in or over any waters, reefs, islands, shores, and lands within the jurisdiction of the United States, a written acceptance of the terms and conditions imposed by this Act shall be filed in the office of the Secretary of State by the parties above named, or a majority of them, their associates, successors, or assigns, or by the company or corporation which may be organised to construct and operate cables under this Act.

Sec. 3. *That nothing in this Act shall be construed to limit the United States in granting to other persons or companies similar privileges herein contained.*

Sec. 4. *That the right to alter, amend, or repeal this Act at any time is hereby reserved to Congress.*

The *Baltimore Sun*, of July 24th, in alluding to the company promoting the above bill gives a somewhat lengthy sketch of the Baltimore and Ohio telegraphs, and also has an article on the subject of the Baltimore and Ohio Telegraphic Cable Company, from which we extract the following :—

The Baltimore and Ohio Telegraph Company announces a list of 535 points in the United States and 33 in the Dominion of Canada which are reached by its own and connecting lines. The places thus reached are in Kansas, Missouri, Wisconsin, Minnesota, Michigan, Illinois, Indiana, Kentucky, Ohio, West Virginia, Virginia, Maryland, District of Columbia, Delaware, New Jersey, Pennsylvania, New York, New Hampshire, Rhode Island, Vermont, Massachusetts, Connecticut, Maine, and Canada. The States through or into which the Baltimore and Ohio Company's own lines extend are Missouri, Illinois, Indiana, Ohio, Kentucky, West Virginia, Virginia, District of Columbia, Maryland, Delaware, New Jersey, and Pennsylvania. The principal cities thus placed in communication with Baltimore are St. Louis, Chicago, Louisville, Cincinnati, Columbus, Sandusky, Pittsburg, and Washington, &c.

The announcement was made on Saturday that the Baltimore and Ohio was preparing to build its own line from Baltimore to New York, and it was stated in official circles that the company would have its own wires through to New York in a very few months. The line is being built through New Jersey this way, from the New York end, and operations will soon begin on the Baltimore end. The Baltimore and Ohio already controls the wire to New York, and when their own is finished will have a through wire from New York to St. Louis. . . . . . In the year 1879 a bill was introduced in Congress to permit railroad companies to do a general telegraph business, most of the railroads having erected their own lines and made contracts of various kinds with the telegraph companies.

This bill anticipated and provided a way for the designs of the railroad companies to form among themselves an opposition to the Western Union Telegraph Company. The Baltimore and Ohio lines formed a very important factor in the American Union system, but their value was only partially acknowledged by the Western Union management. When a new contract was prepared by the Western Union and Baltimore and Ohio for future harmonious operations, certain features of it were objectionable to the Baltimore and Ohio. The Western Union refused to modify it, and the Baltimore and Ohio declined to accept it, and from that time the Baltimore and Ohio has been pushing its own lines with the view of forming the only thorough opposition to the Western Union system.

Following this closely came the announcement that the Baltimore and Ohio was preparing to lay an independent cable between Europe and America, the western end of which will most likely be landed on the Maryland shore. But should the Chesapeake and Delaware canal project succeed it will most likely be landed at Lewes, Delaware, or whatever point is selected as the outlet of the canal. In telegraph circles, however, it is believed that the new cable will be landed in New York, in spite of the announcement that it would probably be landed in Maryland. It is stated that nothing definite will be done in the cable matter until the fall, upon the return of Mr. Robert Garrett from Europe, where he has gone to consult with the European capitalists interested in the undertaking. The cable can be manufactured either in England or in New York, and when completed it is claimed that a steamer like the *Faraday* can lay it in about a month, with favourable weather. When laid it will furnish the only opposition to the present consolidated cable company, whose rates were recently advanced from 25 to 50 cents a word.

Scott's Elevated Wireway.—According to the *Electrician* of New York, this invention consists of a system of housetop cupolas, one on each block, connected with each other by rigid or flexible waterproof tubes, through which common paraffined office wire (say number 18 or 20) can be drawn at will.

Each cupola has a tube connecting it with each of its four neighbouring cupolas. Every block is thus connected with the neighbouring blocks, and through them with every other block in the system, and a wire can be run from any cupola to any other without leaving the tubes.

The wires coming into the cupolas from the tubes are led to cheap connecting screws, where they are connected with those going out through the other tubes. Any wire can, therefore, be interchanged or "patched" if it is found faulty in any section. Wherever a tube crosses a street it is supported by a strong wire that will prevent it sagging. The tubes can be safely stowed away on the housetops without interfering with the comfort of the tenants, and will not be nearly so much in the way as the wires now are.

The paraffined wires may be drawn through the tubes from one cupola to another, either singly or in groups of ten or more at a time, as may be most convenient. Wires lying loosely in this way are affected less by induction than when they all run exactly parallel, as in a cable.

In establishing a new line in a system of this kind the wire is led from its starting point, through the various tubes and cupolas, in the most convenient direction, till it reaches the cupola of the block where it terminates; it is then led from its connecting screw, out at the top of the cupola, through an insulated block, and thence to the roof of the building it must enter.

High Electrical Science at the Academy of Sciences.—The *Comptes Rendus* of the Academy of Sciences of Paris for July 31st contain a somewhat interesting communication, the title of which is in itself a revelation. M. Yves Machai has contributed a note on "Some Theorems of Electricity Inaccurately Demonstrated in Works of Instruction." In this note the writer asserts that errors occur not only in the demonstration but also in the result of a theorem given by M. Mascart in his "Lessons on Electricity and Magnetism," a theorem which establishes a relation between the electric potential at a certain point and the surfaces on a level with it. M. Machai also discusses the demonstration of a theorem given by Clerk Maxwell and the accuracy of a theorem of Earnshaw considered correct by Clerk Maxwell and M. Mascart. M. Machai's conclusion is as follows :—"I could point out other similar instances, but I think I have shown sufficiently by the above examples what attention should be given to the reading of works by even eminent scientific men." The accusation made by M. Machai against the Academy of Sciences is a serious one, and it is not for us to decide upon its truth. It is probable that the question is not at an end, and that M. Mascart will reply. We shall not fail to follow it up.

Dangers from Lightning at Sea and on Land.—There is no reason whatever, says the *Colonies and India*, why every prominent building should not be supplied with one or more perfectly constructed lightning-conductors; and there does not seem to be any reason why ships at sea should not be similarly protected. An iron vessel, and particularly a steamer, which is practically a huge magnet, is especially liable to be struck by lightning, offering as it does a prominent "mark" on the waste of waters; and the accounts which we receive from time to time of ships being struck by lightning at sea suggest a very possible cause of those mysterious disappearances of ships which every now and then are reported. Possibly the cost of lightning-conductors is higher than the average risk of a house justifies the builder in incurring, but if the demand were larger the price would no doubt be reduced.

"The Bewildering Higgs."—This is the title of a smartly-written article in the *New York Times* of June 16th, concerning the peccadilloes of a gentleman formerly resident in London and in the employ of Messrs. Siemens Brothers. It will be remembered that this firm parted with him in consequence of very suspicious circumstances and after legal proceedings against him had been taken. We purpose dealing with this matter more fully in our next.

City and Guilds of London Technological Examinations.—We have received the following list of students who were successful in the examination in electrical engineering at the above examinations. They were all educated at the College of Science and Arts, Glasgow. We may mention that the total number of successes for the kingdom in electric lighting was twenty-seven. (*See* Electrical Review for 5th of August.)

(I certify that the following is correct.
John M. M'Currich,
Hon. Sec. Science Classes, College of Science and Arts.)

Mr. James Livingston is one of the four taking 1st class in honours, and Mr. Crawford is third in the ordinary stage for electric lighting, and gains the bronze medal.

TELEGRAPHY.

Name of Candidate.	Occupation.	Age.	Subject.	Grade.	Class.
Livingston, Jas...	Telegraphist.........	28	Telegraphy ...	Hon.	1
Wilkes, G. S. ...	P. O. Telegraphist.	30	,,	Ord.	2

ELECTRICAL ENGINEERING.

Name of Candidate.	Occupation.	Age.	Subject.	Grade.	Class.
Crawford, Jas. ...	Elect. Eng. Stud...	25	Elect. Lighting	Ord.	1
Arnot, Nigel......	Elect. Light Eng...	25	,,	,,	1
Watkinson, Wm.	,,	21	,,	,,	1
Carswell, T.	Elect. Eng. Stud...	21	,,	,,	2
Conner, B.	,,	16	,,	,,	2
Downs, Alex......	,,	33	,,	,,	2
M'Ewen, H.	,,	17	,,	,,	2
M'Cullouch, N...	,,	16	,,	,,	2
Miller, J. D., jun.	Telephonist	18	,,	,,	2
Pinkerton, R......	Elect. Eng. Stud...	46	,,	,,	2
Richardson, R. ...	Electrician	15	,,	,,	2
Robertson, G. jun.	Elect. Eng. Stud...	21	,,	,,	2
Ross, Wm.........	,,	26	,,	,,	2
Smith, D. C.......	Electrician	22	,,	,,	2
Turnbull, W.......	Elect. Eng. Stud...	18	,,	,,	2
Wright, P., jun...	,,	17	,,	,,	2

On Perry's and Ayrton's Metallic Galvanic Battery.—By B. J. Goossens.—According to Perry and Ayrton, a galvanic combination may be obtained by plunging plates of platinum and magnesium into mercury. According to them, this is not the case if other metals, *e.g.*, zinc, are used, because the impurity and great conductivity of zinc, combined with the great liquidity of the amalgam, cause the energy available for the production of a current from the zinc to the non-amalgamable metal to be extremely small. The magnesium amalgam is solid, and the above-mentioned physicists obtained with this element a maximum electromotive force of 1·56 volts. = about 1·5 Daniell as measured with the electrometer.

The experiments of Obach (*Pogg. Ann.*, Ergänzungsband, 1876, p. 300) are in complete contradiction with this result; currents are, indeed, obtained also on the amalgamation of zinc, but these are true thermic currents, which owe their origin to the changes of temperature depending on amalgamation.

Obach, however, did not experiment with magnesium, and, as the subject is of great theoretical importance, the author resolved to repeat the experiments with this metal.

For measuring the current he employed a Thomson mirror-galvanometer, which, with an iron-copper element and slight resistance, gave an indication of 25° of its scale for a change of temperature of 0·1° C.

The mercury was purified with diluted nitric and concentrated sulphuric acid, and was afterwards repeatedly washed with distilled water and carefully dried.

This mercury was placed in a U tube fitted with an enlargement at the top on either side, for the reception of a small plate of platinum, and on the opposite side one of magnesium. The platinum was left permanently in the mercury, and the magnesium was fixed in a wooden slide, by which it could be let down into the mercury. Into the wide parts of the tube there were plunged near, respectively, to the platinum and the magnesium two soldered points of a thermo element, in order to permit the course of the changes of temperature to be observed. The thermo element consisted of an iron wire, to the end of which were soldered copper wires, and it was insulated from the mercury by a coating of lac-varnish.

In order to eliminate possible changes of temperature from external influences, the glass tube was folded round with cotton and placed in a wooden box, and all the points of contact were likewise wrapped in cotton. The experiments were performed in a room not artificially heated. The copper connection wires, coated with silk, were led to a mercury tilt, in order to convey the current of the magnesium-mercury-iron element and of the thermo element through the galvanometer in rapid succession.

As soon as the thermo-element indicated no current and the mercury in both limbs of the tube indicated, consequently, the same temperature, the magnesium was let down into the mercury.

The first deviation of the needle of the galvanometer was not always in the same direction, which may be due to a slight difference of temperature between the magnesium and the mercury. In a few minutes the deviation was always in the same direction, indicating a current from the mercury to the magnesium, consequently a heating current (Wiedemann's "Galvanismus," I. p. 810) increasing rapidly at first, then remaining for a length of time almost constant, and finally decreasing a little. The thermo-element indicated at the same time a heating of the mercury near the magnesium, and its current showed the same changes as the other.

The values obtained in the numerous experiments were not all of equal magnitude, but were all in the same direction. A single example will suffice to show the cause of the experiments:—

Galvanometer Deviations.

Magn. El.......	10	20	40	45	60	80	100
Therm. El.......	100	160	200	240	280	320	370

Half an hour later :—

Magn. El.......250. Therm. El.......700.

From the direction of the current and from the observed rise of temperature, it may be concluded that the current obtained on the amalgamation of magnesium as well as Obach's amalgamation currents is a true thermic current, and has its cause in the rise of temperature accompanying the formation of the magnesium amalgam.

If magnesium and platinum are placed in one vessel near each other a current is observed which at first quickly increases, but then again decreases in consequence of the progressive heating of the platinum, and because magnesium has a place intermediate between mercury and platinum in the thermo electric series.

The following deviations of the needle were obtained at successive intervals of a quarter of an hour: 10, 120, 120, 100, 80.—*Wiedemann's Annalen.*

On Lightning Conductors.—By M. Melsens.—I propose to reply on a future occasion in a complete manner to the various objections raised against my system of lightning conductors. I will, in particular, discuss the opinion which sees danger in the use of a sort of cage formed of multiple conductors, among which some persons seem to fear the production of sparks of electrostatic induction. I will merely for the present recall an experiment which seems to me decisive, and which has been thus regarded by many physicists. This experiment supports those of Faraday, which prove that no electric manifestation is possible in a cage with continuous metallic sides, or of metallic network placed in perfect communication with one common reservoir.

Any small animal, such as a rabbit, &c., is placed in a hollow globe of metallic network placed upon the coating, or suspended from a powerful Leyden battery. The attempt was then made to strike the animal by the discharge. But far from being struck down the animal did not experience any action from a spark which would have been dangerous or even mortal but for the protection of the metallic cage.

The cage represents my lightning conductor, and the animal enclosed represents a house with its inhabitants, and the combustible matter which it may contain. I remark, further, that my conductor is fitted with numerous points, which certainly have not the property of provoking electric manifestations in the interior of a metallic cage, especially if it is in perfect connection with the moist earth, or with large metallic surfaces, or in a town with the water and gas pipes.—*Comptes Rendus.*

"ON SINGING CONDENSERS."—By W. Holtz.—In view of the attention which has been latterly given to the so-called singing condensers, I remark that as far back as 1875 (*Annalen*, 1875, p. 496), I made mention of a similar phenomenon, which, however, remained unnoticed. I observed it in hollow metallic discs, which I used as the electrodes of an influence machine, on bringing them so near that sparks struck across between them. I remarked then that on gradual approximation the tone did not become continually, higher but occasionally ceased entirely, because the dimension of the disc could not correspond to every height of tone, and that this is the best proof that the sound in question is not merely the sound of discharges, which may be also proved by transferring the latter to a distance. Whoever wishes to repeat the experiment, for which a single disc suffices, placed opposite a large globe, will proceed most correctly, in order to vary the approximation and the length of sparks independently of each other, if he allows the sparks to strike from one discharging rod to one of the sliding cylinders of the well-known intercalatory apparatus. With a certain succession of sparks and at a certain approximation the disc sings more distinctly, but it can sing at very different heights. Generally we hear simultaneously several and indeed disharmonic tones, such as may be heard in vibrating plates. Leyden jars must be first removed.—*Wiedemann's Annalen.*

ON DOUBLE REFRACTION IN GLASS AND SULPHURET OF CARBON OCCASIONED BY ELECTRIC INFLUENCE.—By H. Brongersma.—The author has re-examined the phenomena first observed and described by Kerr in his memoirs on "A New Relation between Electricity and Light" (*Phil. Mag.*, 1875, p. 337), chiefly because certain physicists have failed to obtain the same phenomena as far as solid bodies are concerned. He found, however, that the doubts as to the correctness of Kerr's results are unfounded. If explanations based upon the supposition that electricity produces these phenomena in an indirect manner are not confirmed by an experimental examination, it becomes more and more probable that we have here to do with a hitherto unknown action of electricity upon the luminous vibrations.—*Wiedemann's Annalen.*

A GALVANIC ELEMENT.—By Kuhlo.—The earthenware cylinder of a Daniell's element is replaced by a tube of parchment paper, which is fixed by means of india-rubber rings to a cylindrical frame of an insulating material consisting of a bottom plate and superimposed rods, connected above.—*Electrotechn. Zeitschrift.*

CHROMIC ACID ELEMENTS.—The zinc plate is laid on the bottom of the cell, or preferably zinc amalgam is put into a shallow beaker, as the solutions of chrome, alum, and sulphate of zinc, being heavier, sink to the bottom and do not attack the zinc.—*Wiedemann's Beiblätter.*

NEW COMPANY REGISTERED.

PATENT ELECTRIC GAS IGNITING COMPANY (LIMITED).—Capital £100,000 in £5 shares. Objects:—To manufacture Clarke's patent electric lamp and apparatus and appliances for the lighting of gas by electricity or for the generation, accumulation, or transmission of electricity either as a motor, igniting or lighting power; also to acquire the properties and liabilities of the Electric Gas Lighting Company (Limited) and of the London and Provincial Electric Gas Lighting Company (Limited). Signatories (with one share each): Sir R. W. Rawson, 68, Cromwell Gardens; Francis Bennoch, F.S.A., 5, Tavistock Square; S. F. Porter, Putney; J. Leigh and William Milne, Alderley Edge, Cheshire; J. H. Stretton, 2, Dean Street, Park Lane; J. A. Hilliard, Grove Park, Kent. The signatories are to appoint the first directors. Remuneration: Chairman, £300 per annum; deputy chairman, £200 per annum; ordinary directors, £150 per annum each. The members of the board will also be entitled to a commission of 1 per cent. upon the amounts received from the sale of foreign patents, and after 2½ per cent. of the net profits remaining after payment of 10 per cent. to the shareholders. Registered 2nd inst. by Newman & Co., 75, Cornhill.

NEW PATENTS—1882.

3698. "Micro-telephonic apparatus." J. H. JOHNSON. (Communicated by A. D'Arsonval.) Dated August 3.

3700. "Secondary batteries." E. G. BREWER. (Communicated by O. Schulz.) Dated August 3.

3705. "An improved construction of electric lamp." J. L. SOMOFF. Dated August 4.

3710. "Improvements in electric lighting and in apparatus connected therewith." T. PARKER and P. B. ELWELL. Dated August 4.

3712. "Construction and arrangement of the cores and armatures and other parts of electro-magnets." S. C. C. CURRIE. Dated August 4.

3713. "Electric arc lamps." E. G. BREWER. (Communicated by Société Anonyme des Ateliers de Construction Mécanique et d'Appareils Electriques.) Dated August 4.

3751. "Electrical signalling apparatus for railway or other purposes." W. R. LAKE. (Communicated by G. W. and A. D. Blodgett.) Dated August 5.

3752. "Means employed in or for transmitting electricity for light, power and other purposes." T. J. HANDFORD. (Communicated by T. A. Edison.) Dated August 5.

3753. "An improved combined holder and switch for incandescent electric lamps." C. E. SIBLEY. Dated August 5.

3755. "Electrical meters." T. J. HANDFORD. (Communicated by T. A. Edison.) Dated August 5.

3756. "Dynamo or magneto-electric machines." T. J. HANDFORD. (Communicated by T. A. Edison.) Dated August 5.

3757. "Improvements in the manufacture of light emitting conductors for electric lighting purposes and in apparatus therefor, which apparatus is also applicable for other purposes." R. WERDERMANN. Dated August 5.

3762. "Apparatus for utilising the force of fluids, air, and water (producing electric currents)." E. E. H. ROUSSEAU. Dated August 8. (*Complete.*)

3763. "Telephones." J. J. BARRIER and F. F. DE LAVERNÈDE. Dated August 8.

3770. "Preparation of lead for use in the cells of secondary batteries." L. EPSTEIN. Dated August 8.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1881.

5286. "Production of the electric light, &c." A. R. SENNETT. Dated December 3. 6d. Has for its object improvements relating to the production of the electric light, more especially with reference to that system in which it is obtained by the incandescence of a continuous conductor enclosed in a vacuous receiver. Firstly, in the preparation and production of a conductor more uniform in its specific electrical resistance, and better adapted to withstand the very high temperature to which it must necessarily be subjected, and to the disintegrating action of the residual gas of the receiver. Secondly, in the method of compressing and compacting the same so as to render it extremely dense and imporous. Thirdly, in the method of carbonising the same. Fourthly, in the method of mounting the same. Fifthly, in the method of eliminating the atmospheric air from the receiver. Sixthly, in the method of making the joint between the material of the receiver and of the conductors. To obtain these objects the inventor reduces any material sufficiently pure, and containing a high percentage of cellulose, to a finely divided, jelly-like state or pulp (either fibrous or otherwise) by chemicals, or other means. In this condition the whole of the impurities so detrimental to the durability of the conductor can most conveniently be removed by the usual chemical means; from this are formed by moulding, or other operation, the required conductors. In order to produce the requisite hardness and compactness, the inventor moulds or forms the conductor under great pressure, whilst to insure its imporosity this operation is caused to take place (very slowly) in a vessel from which the air is being constantly exhausted.

5367. "Machine for coating insulated electrical conductors with lead." W. R. LAKE. (A communication from abroad by Hiram Stevens Maxin, of Brooklyn, America.) Dated December 8. 6d. Relates to a machine for covering insulated wires with lead. (*Provisional only.*)

5396. "Electric lamps." C. F. VARLEY and F. H. VARLEY. Dated December 9. 6d. Consists mainly as follows:—A hollow cylinder of sufficient length to hold the carbon rod is provided with a spiral spring or propelling weight, for the purpose of feeding the carbons. At or near the feeding end or cap of the cylinder is a roller contact-clutch, which is made to be adaptable for varying diameters of carbon rod, and through which the current is conveyed to the carbons. In one arrangement an insulated swing arm is used, fixed into the cap, which carries a fixed opposite carbon pole. To charge this lamp the swing arm is moved on one side. The carbon rod or candle is inserted through the roller contact-clutch, and forced into the socket attached to the lower, or remote end, of the spiral spring, and this forces back the spring to the length of the carbon to be used. The roller clutch is provided with a magnetic regulator, for determining the length of the arc.

5524. "Electric lamps, &c." RANKIN KENNEDY. Dated December 17. 8d. Relates to both incandescent and arc electric lamps, and its objects are principally to facilitate the manufacture, to render certain parts or connections more satisfactory and durable than as hitherto made, and to obtain an improved automatic regulation. Figs. 1 and 2 show the improvements in arc lamps in which the length of the arc and the movements of the carbons are regulated by means of the lamp current passing through the solenoid, *a*, as shown, thereby acting magnetically, as is well understood, upon the core, *c*, which is connected to the crossbar, *d*. This crossbar, *d*, carries at its ends the pawls, *e*, *e*, and is at the same place coupled to the pawl levers, *f*, *f*, by pins, *n*, *n*, which pass through holes in the crossbar, *d*, pawls, *e*, *e*, and pawl levers, *f*, *f*, the latter being mounted at their outer ends upon the axes, *g*, *g*, which also carry the ratchet pulleys, *h*, *h*. The upper carbon is attached to the core, *c*, of the solenoid, *a*; and the lower carbon, D, is attached to the carbon holder, B, which is suspended by cords, *i*, *i*, passing over the ratchet pulleys, *h*, *h*, and is kept in proper working position by the antifriction rollers, *k*, *k*, bearing against the upright bars of the framing, *j*. When the lamp is put into circuit the current passes through the solenoid, *a*, thence through the wire, *m*, to the upper carbon, C, and from this the current passes across a space occupied by the arc to the lower carbon, D, which is not insulated from its carrier, thence to the return wire, E, through the metallic connections formed by the rollers, *k*, *k*, and the framing, *j*. When the current passing through the solenoid, *a*, is of less than the proper strength, the solenoid core, *c*, descends, and at the same time releases the pulleys, *h*, *h*, so that the carrier, B, and the lower carbon, D, rise, while at the same time the upper carbon descends. This shortens the arc, and allows a greater quantity of current to pass; the solenoid then draws up the core, *c*, and thus checks the pulleys, *h*, *h*. An adjustable screw stop, *l*, is fitted at the upper end of the solenoid, *a*, so that the raising action of the core is limited to give the precise length of the arc described.

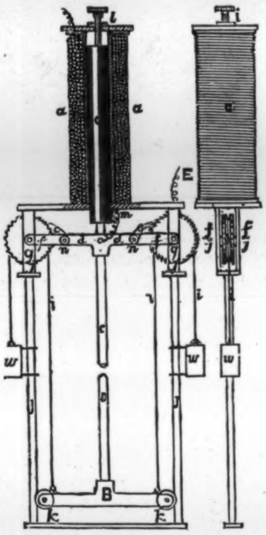


FIG. 1. FIG. 2.

5577. "Electric telegraphs." SIR JAMES ANDERSON and BENJAMIN SMITH. Dated December 20. 6d. Has for its object improvements in electric telegraphs, and relates more especially to the means of and apparatus for retransmitting or "translating" telegrams from one telegraph cable or telegraph line to another. The improvements render fewer the operators to be employed and expedite the transmission of telegrams.

According to this invention one set of instruments can be employed, one key and one recorder for the two cables, and for this purpose the inventors employ a novel switch having a lever handle which has three positions. In the central position of the handle both cables (or the condensers into which the cables work, if such be employed, as is usual) are connected through the recorder to earth, and in this position a call signal sent through either cable is received upon the paper of the recorder. When the handle is moved to either side one cable remains connected with the recorder, whilst the other becomes connected with the key and through the key with the battery. The operator then on receiving a call moves the handle over from the central position to that side which leaves the calling station connected with the recorder, and as the telegram comes in he reads it from the paper of the recorder and retransmits it by means of the key into the other cable. When the handle of the switch is moved over to the other side the connections are reversed and become suitable for working in the opposite direction through the cables. The same movement of the handle alters the battery from what is suitable for one cable to that which the other cable requires.

5601. "Electrical brushes and combs." J. N. ARONSON. Dated December 21. 6d. Relates to electrical brushes and combs for the application of currents of electricity to the skin of the head and roots of the hair, for promoting the growth of the hair and for curative and remedial purposes. The invention relates to the combination with a brush or comb constructed for the transmission of electric currents to the skin and roots of the hair, of an induction coil and battery for the generation of the currents, and to the peculiar construction of the brush and comb for the purposes above mentioned.

5618. "Holder for incandescent electric lights." DAVID GRAHAM. Dated December 22. 6d. Relates to a new or improved holder for incandescent electric lights, and consists of a piece of insulating material, in the one end of which a screw thread is cut, or a screwed bush may be placed thereon, in order to attach the holder on to the screw of an ordinary burner socket of a gas bracket or gasalier. This block or plate of insulating material has placed on it a spring, or elastic socket, for holding the parallel or tubular part of the glass chamber of an incandescent light. The spring, or elastic holder, is made in two portions, insulated from each other. Into each portion a pinching screw passes, which, when the lamp is placed in its socket, bear upon the two metallic tongues leading and joined to the platinum or other wires to which the carbon is joined. Thus these pinching screws form electrical connection between the outside metallic portions of the holder and the interior of the lamp, so that by their means when a current is passed through the holder it is transmitted by the pinching screws to the lamp conductors. The holder may be provided with a switch or an equivalent apparatus for making and breaking contact. Electrical connection with the light holder is made by passing the wires of a circuit by preference, for the sake of convenience and neatness, through the tube of a gas bracket or gasalier out through openings formed in the side of the nozzle or gas burner socket, these wires being insulated from the metal of the socket.

5639. "Electrical alarm apparatus for railway trains." DOTTORE SALVATORE GARAU. Dated December 23. 6d. Has for its object improvements in electrical alarm apparatus for railway trains, to enable passengers to give an alarm to the guard or driver in case of necessity. For this purpose the inventor provides at each end of each carriage of a railway train, in addition to its ordinary buffers, two other insulated metallic buffers pressed outwards by springs to a distance somewhat exceeding that to which the ordinary buffers are pressed out, so that when a train is made up the metallic insulated buffers are of necessity brought into contact with one another. The insulated buffer at one end of each carriage is coupled by an insulated wire with one of the buffers at the opposite end of the carriage, and similarly couple together the other two buffers. At any desired number of points at the sides and ends of the carriages are affixed a series of contact apparatus so constructed that by the pulling out or pushing in of a stop an electrical contact may be established between the two terminals of a contact apparatus to which the stop belongs. One of the terminals of each contact apparatus is connected by a wire with one of the wires connecting two of the insulated buffers, and the other terminal with the other wires connecting the two other buffers.

5651. "Electric current meters." ST. GEORGE LANE FOX. Dated December 24. 6d. Has reference to improvements in electric-current meters, and especially to that class of apparatus described in the specification of former letters patent granted and dated November 14, 1878, No. 4626, in which apparatus the position or motion of an armature due to the amount of current passing through a corresponding electro-magnet, controls the working of the clockwork or mechanism of a counting apparatus. One part of this invention consists in the employment of a magneto-electric motor to give a constant motion to a certain shaft in the meter—the inventor uses a horizontal shaft free to oscillate about a vertical axis passing through its centre; at the ends of this shaft are placed two armatures, each opposite an electro-magnet; or there may be only one armature and a corresponding electro-magnet. It is arranged that these magnets (when there are two) are put into action alternately by springs which make contact according to the position of the shaft, and by properly balancing and weighting the shaft perfectly regular oscillations are obtained. An auxiliary spring is employed in connection with the shaft so as to insure one of the connections being made when the instrument is at rest, so that it may start directly any current flows.

5656. "Apparatus for working electric clocks, &c." E. G. BREWER. (A communication from abroad by C. E. Buell, of America.) Dated December 24. 8d. The object of the first part of this invention is to dispense with the use of local batteries as ordinarily used at the sub-stations of a line used for controlling electric clocks, and to this end is devised a certain combination of a relay in a constantly closed main-line circuit with a secondary battery in a derived circuit, together with a clock to be operated by the battery in such circuit, the whole being combined with an electro-magnetic switch controlled by the relay in the main-line circuit in such a way that in one position of the switch the secondary battery is charged by the current flowing through the main-line, while in the other position of the switch the derived current from the main-line is broken, and the current of the secondary battery is closed locally through the operating or controlling electro-magnet of the electric clock. By this combination of apparatus the clock can be operated with certainty and at the same time dispense with the use of local galvanic batteries ordinarily employed in conjunction with relays in the main-line circuit. The object of the second part of this invention is to operate fire-alarm signal apparatus upon the same circuit with electric clock apparatus in such a way that the operation of signalling by the fire-alarm devices shall not interfere with the correct transmission of the impulses which control the clocks, while *vice versâ* the operation of controlling the clocks at sub-stations from the standard clock at a central or terminal station shall not at any time prevent the transmission of the fire-alarm signals. The object of the third part of the invention is to so combine the apparatus for sending the controlling impulses for electric clocks, and telephone indicating and signalling apparatus, that the two systems may be used upon the same line without interference with one another.

5660. "Electric lamps." L. S. POWELL. (A communication from abroad by J. M. A. Gérard-Lescuyer, of Paris.) Dated December

24. 6d. Relates to electric lamps and it consists in certain improvements in the construction and arrangement with the apparatus for automatically operating and regulating the feed of the carbons employed to produce the voltaic arc as hereinafter described. Figs. 1, 2, 3, and 4 represent a lamp worked by alternate currents to which the invention is applied, the said figures representing respectively a vertical section, a side elevation, a plan, and a horizontal section of the said lamp. This apparatus operates as follows:—Before lighting the lamp the carbons are separated, so that the current being unable to pass along the carbons is entirely diverted into the shunt or coil of the electro-magnet, which thus becomes excited and attracts the two armatures, O and T. The attraction exerted on the upper armature, T, has the effect of drawing down the short vertical rods, S, and thus opens the claws, U, causing them to release the upper carbon holder, which thereupon slips down very slowly, its descent being retarded by the partial vacuum produced behind the piston, I. The rate at which the carbon descends may thus be controlled by adjusting, by means of the valve, the rate at which air is allowed to pass into the tube, F, above the said piston, I. The lower armature, O, is also attracted by the electro-magnet at the same time that the upper armature is attracted and in such a manner as to draw up the rods, A, connected with the lower carbon holder, D. When the carbons are brought into contact the current passes through them almost exclusively, so that the electro-magnet, E, is demagnetised. The armature, T, connected by the rods, S, with the claws of the brake is then raised by the helical springs, W, around the said rods, and the claws, U, again clasp the upper carbon holder, whilst at the same time the lower carbon holder is also released and allowed to drop by its own weight for a distance regulated by the nuts or stops, R, on the rods, A, thus establishing the arc. When the resistance at the arc becomes excessive the power of the current in the coil of the electro-magnet, E, is increased, whereupon the armatures are again attracted and the carbons are brought together as hereinbefore described.

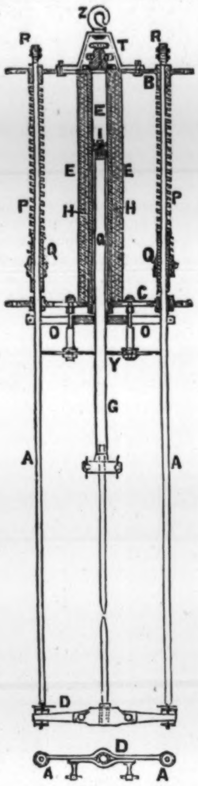


FIG. 1.

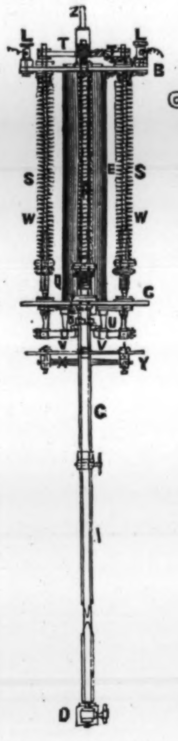
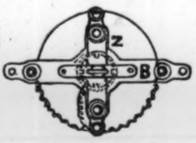


FIG. 2.

FIG. 3.



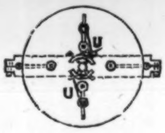


FIG. 4.

5661. "Pipes for containing electrical conductors." J. H. JOHNSON. (A communication from abroad by Clément Labye and Léon de Locht-Labye, both of Paris.) Dated December 24. 6d. Relates to pipes or conduits for containing electrical conductors or wires, and it consists of an improved method of arranging and enclosing the said conductors or wires in a conduit or chamber constructed with a removable cover. This conduit is first placed in position in the ground, after which the wires are arranged in its interior in layers being imbedded in asphalte or other suitable insulating material, are further protected from injury by a cover which is subsequently attached to the conduit. (*Provisional only.*)

5665. "Apparatus for producing and regulating electric light, &c." S. A. VARLEY. Dated December 24. 10d. Has for its object improvements in apparatus for producing and regulating electric light. In producing electric light it is desirable the electricity produced should be as nearly as possible of uniform potential, and therefore that the light circuit should be of as nearly as practicable constant resistance. A fault common to dynamo-electric machines is that the electricity developed by them even under favourable conditions is of a more or less undulating potential. Now by the present invention this defect is reduced and the electricity developed is made to automatically regulate its production and also to regulate the resistance of the light circuit. To this end the inventor constructs a number of wheels which he terms the "armature wheels;" the periphery of each of these wheels consists of an even number of iron blocks magnetically insulated from one another, which blocks are called the "bobbin armatures." These armatures are grooved out in the centre to receive the bobbin magnets and when completed present a nearly continuous surface of iron to the field magnets. B (fig. 1) represents one of the armature wheels; its periphery consists of an even number of blocks of iron, A, having notches or grooves, $A^{\times}$, cut in them. These blocks are magnetically insulated from one another by the teeth or projections, A^2, and are mounted on the wheel, B, which is constructed of a suitable non-magnetic metal, to which they (the blocks) are brazed, or soldered, or attached by other suitable means. These armature wheels are mounted, at equal distances from one another, on the axle, $A^{\times\times}$, of the machine, as shown in fig. 2. Soft iron bobbin magnets, C, wrapped with coils or bobbins of insulated wire, C, fit into the notches of the blocks of iron, A. The armature wheels are mounted on an axle at equal distances from one another, the recesses in the armature blocks being arranged in a line with the axle, the bobbin magnets fit into these recesses, and it is preferred to construct them of a number of thin plates of iron arranged side by side magnetically insulated from one another by pieces of paper or other suitable insulating material placed between the plates. Fig. 3 is a front view, and fig. 4 is an end view of one of the bobbin magnets, C, and one set of bobbins, C^1. The bobbin magnets are wrapped with insulated wire in the spaces between the armature wheels, which

FIG 1

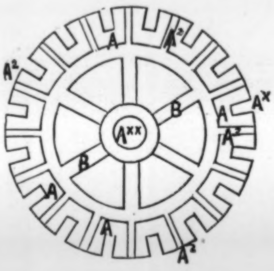


FIG 2

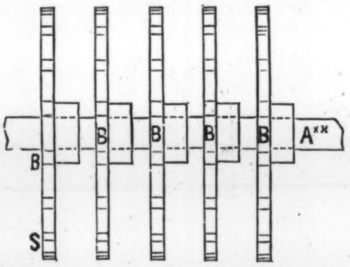


FIG 4

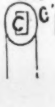


FIG 3

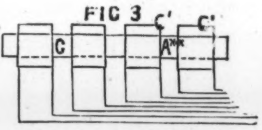
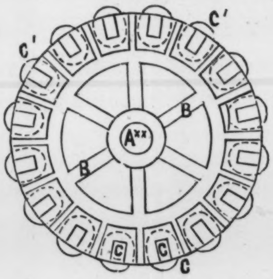


FIG 5



wheels divide them into sections. Fig. 5 is an end view of the armature wheels, with the armature blocks, bobbin magnets, and bobbins mounted in their places.

5667. "Collection and distribution of electric currents." S. A. Varley. Dated December 24. 6d. According to this invention the inventor causes the contact poles of the dynamo machines to move in contact with the insulated segments connected to the armature coils with a rolling friction and he imparts to the poles a motion of rotation equal to or slightly greater or slighly less in circumferential velocity than the motion of the insulated segments.

5674. "Transmitting and receiving apparatus for type-printing telegraphs." Sydney Pitt. (A communication from abroad by Henry Van Hoevenbergh, of America.) Dated December 27. 10d. Relates to type-printing telegraphs in which the type wheels of the receiving instruments are impelled by a weight or spring acting through suitable intermediate wheel-work, and the progressive movements of said type-wheels are controlled by a series of electrical pulsations alternately of opposite polarity, which are transmitted over the main line from the sending station. These pulsations cause the rapid to-and-fro vibration between electro-magnets of an armature, suitably constructed to be actuated by such alternating currents and the vibrating in turn controls the type wheel, by means of a step-by-step escapement, of well-known construction. In the improved apparatus the printing is effected by increasing the strength of the electric current during some one of the pulsations, without reference to its polarity, at the instant the required division or character of the type wheel is opposite the platen, and this action takes place without retarding the progressive movement of the type wheel, or interrupting the regular succession of electric pulsations. The momentary stoppage of the type wheel shaft at the termination of each vibration of the step-by-step escapement affords sufficient time to permit an impression to be taken from the type wheel by means of proper mechanism.

5681. "Construction and arrangement of dynamo-electric machines." J. Richardson. Dated December 27. 4d. Relates mainly to a particular construction and arrangement of armatures in couples or pairs capable of augmentation in connection with field magnets to produce a constant electrical current of uniform intensity. For the purposes of the invention the inventor arranges a series of two armatures at right angles to each other, and so fitted in connection with field magnets that one is at the point of maximum when the other is at the point of minimum intensity, and as one increases in intensity in the same ratio the other diminishes the sum of the two will produce a constant intensity of current. Six pairs of these armatures with their corresponding field magnets are preferably arranged in the same machine, and it is evident that any number from one pair upwards can be used with an augmentation in electricity according to the number used, and that all can be "coupled up" to two contact pieces on the commutator overlapping each other by one-fourth of its circumference, or, if necessary, two commutators could be used and three pairs of armatures coupled to one and three pairs to the other, their axes being at an angle of 45° with the others, if such an arrangement was necessary, to produce still greater uniformity of current. This system of construction and arrangement also possesses the advantage of simplicity of manufacture, a great variety of sizes of machine being possible to be made from the same patterns simply by lengthening the bed plate and coupling together greater numbers. All the winding can be done by machinery, thus economising labour, and the armatures can be coupled together for either quantity or intensity as may be required, also either one or all the pairs can be used to excite the field magnets according to the strength required in them.

5687. "Controlling and regulating the production and distribution of electricity." C. A. Carus-Wilson. Dated December 27. 8d. Has reference to means or apparatus for controlling and regulating the production and distribution of electricity. One part of the invention consists in a method of acting upon the generating machine, water, steam, gas, or other engine in addition to the ordinary governor; the inventor permits the governor to regulate the motion of the engine in the usual way, but supplements its action so that it regulates the cut off with respect to the electromotive force produced. The manner in which this may be effected is as follows:—The inventor arranges that a force, preferably a weight, shall be brought to bear upon the governor as it rotates, and that this force shall be under the control of two electro-magnets, one to apply the force and another to take it off. These magnets are respectively brought into action by currents whose circuit is made and broken by a galvanometer needle. When the engine is producing the desired electromotive force, the galvanometer needle is stationary between two stops, a short way apart, the weight or other force meanwhile keeping the governor down a little, and when the electromotive force rises tbe needle is deflected against one of the stops, making circuit through one of the magnets, and this will alter the force on the governor, causing a decrease of speed and hence a decrease of electromotive force. On the other hand, if the electromotive force fall, the needle will touch the other stop, and thereby cause the other magnet to act and the weight or other force to be applied to the governor in the other direction, which will increase the electromotive force.

5702. "Sockets or holders for electric lamps." J. W. Swan. Dated December 28. 6d. Relates to improvements in sockets or holders for electric lamps, whereby a lamp without any external fittings can be readily attached to the conducting wire and a good contact between them and the terminal hooks or eyes of the lamp can be effected and maintained. In carrying out the invention the holder is provided with two hooks or equivalent devices insulated from each other and terminating in binding screws or contact pieces on opposite sides of the holder or suitably arranged for making concentric contacts by the act of screwing the holder to the lamp bracket or other support for the lamp. In either case contact between the lamp and the lamp socket or holder is effected by engaging the two hooks or their equivalents belonging to the socket with the two eyes or other counterpart devices which constitute the terminal conductors of the lamp. Firm contact between the hooks and the eyes or their equivalents of the lamp and socket is produced by the action of a spring placed in compression or in tension by the act of making the connection between the lamp and its socket or by the act of screwing or sliding towards the lamp an external tube so that an outward pressure may be exerted upon the lamp tending to put the hooks and eyes or their equivalents into tension and thus effecting and maintaining a good electrical contact.

5738. "Electric lamps." J. G. Lorrain. Dated December 31. 4d. Relates to improvements in incandescent and other electric lamps, and has for its object diffusing the light and economising the same by preventing its radiation in directions where its effects are not required and of concentrating the light in a required direction and also rendering it more pleasant to the eye, and the invention consists in silvering or coating with a reflecting material a portion or portions of the bulb or globe of the lamp in such a manner as to produce the effects before mentioned.

5743. "Electrical resistances." Gustav Pfannkuche and R. E. Dunston. Dated December 31. 6d. Relates to certain improvements in the construction of electrical resistances. On account of the heat developed in the resistance coils or boxes as at present existing these arrangements are exceedingly bulky, unhandy and expensive, and it is obvious that it is possible to use wires or other materials of very high resistance and at the same time make provision for uniformly distributing and carrying away the heat developed in these wires or other materials a very efficient and handy and cheap resistance apparatus can be produced. To effect this the inventors propose to use wires or other suitable materials of high resistance and of a size proportional to the required amount of resistance and to embed or envelop the same in a mass of a bad conductor of electricity, such as glass or plaster of Paris or asbestos, or any other non-conducting mass, shaping the same in such a manner as to get as large as possible a cooling surface and to rapidly take up the heat developed in the resistance wires or other material, and thus preventing the resistance material from being destroyed or fused when a strong current is made to pass through it. It will be seen that in this manner comparatively very small wires or other materials can be used as resistances for large currents, thereby materially reducing the size and expense of such resistance apparatus.

5751. "Operating or controlling railway brakes by electricity." W. R. Lake. (A communication from abroad by Augustus L. Duwelius, Leonard W. Goss, Paget Higgs, Frank R. Merrell, Hiram D. Peck, and Hugo Walter, all of America.) Dated December 31. 6d. Relates to the application of electricity for operating the brakes of railway trains, and embodies various improvements designed to render the same practicable and efficient. These improvements comprise the following features, that is to say—combining in such a manner as to be under the contrel of the engine-driver one or more generators of electricity with storage batteries or other electric accumulators and suitable connections with the brake actuating mechanism. A method or system for circuiting the electro-brake mechanism of a train of railway vehicles, consisting in the employment of main conductors attached in separable sections to each vehicle and forming, when connected, substantially continuous electric mains, with permanent cross connections at each vehicle in which the electro mechanism of the brakes is interposed. The construction and arrangement of electro-brake mechanism by which the electro-magnetic force is applied.

CITY NOTES.

Old Broad Street.

ANGLO-AMERICAN TELEGRAPH COMPANY (LIMITED).

The report of the directors ran as follows:—The total receipts from January 1st to June 30th, 1882, including a balance of £4,811 13s. brought over from the last account, amount to £208,750 1s. 7d. The traffic receipts show a decrease, as compared with the corresponding period of last year, of £94,349, consequent upon reduced rates.

The total expenses of the half-year, including income-tax and repair of cables, &c., as shown by the revenue account, amount to £58,166 1s. 10d.

The directors, under the powers conferred upon them by the articles of association, have, before declaring the net profits, set apart the sum of £75,000 to the renewal fund, leaving an available balance of £75,583 19s. 9d.

One quarterly interim dividend of 5s. per cent. on the ordinary stock, and of 10s. per cent. on the preferred stock, free of income-tax, was paid on May 1st, 1882, absorbing £17,500, leaving a balance of £58,083 19s. 9d., from which a second quarterly dividend of 15s. per cent. on the ordinary stock, and of 30s. per cent. on the preferred stock, free of income-tax, will be paid on August 1st, 1882, leaving a balance of £5,583 19s. 9d. to be carried forward to the next account.

The cable laid by this company in 1874 was broken off the coast of Ireland on November 22nd, 1881; it was successfully repaired on February 5th last, and has since worked well.

The Brest-St. Pierre cable, laid in 1869, was broken in mid-ocean on March 18th last. The repairs have been intrusted to the Telegraph Construction and Maintenance Company, and, from the progress already made, the directors hope soon to be able to announce the restoration of communication by that cable.

The company's repairing ss. *Minia* has been engaged during the half-year in repairing the St. Pierre-Duxbury cable, laid in 1869, the Placentia-St. Pierre cable, laid in 1872, and the South Placentia cable, laid in 1873. The company's system of cables and land lines on the other side the Atlantic is now in good working order and condition.

The ordinary general half-yearly meeting of the company was held in the City Terminus Hotel, on Friday, the 4th inst., the Right Hon. Viscount Monck, chairman of the board, presiding.

The Secretary, T. H. Wells, Esq., having read the notice convening the meeting, the minutes of the last ordinary and extraordinary meeting were read, approved, and signed.

The report was taken as read.

The Chairman said: Gentlemen, it will be in your recollection that at our last half-yearly meeting, we were engaged in a competition with a telegraph company, formed in America and known by the name of Mr. Jay-Gould's Company. You are also aware that at an extraordinary meeting, the minutes of which have just been read, held subsequently to that half-yearly meeting, we passed resolutions confirming an agreement with that company, which brings us into a state of harmony with them. Well, gentlemen, I merely allude to that fact, because it prevents us from doing what I generally do at this half-yearly meeting, institute a comparison between the receipts which have accrued to us during the past half-year, with the receipts of the previous half-year. It is obvious that no satisfactory comparison of that kind can be made at present, because the circumstances under which we were operating during the half-year to which I allude were of a nature which renders it impossible to institute any comparison between the receipts. The rate of tariff was entirely different, therefore any comparison between the aggregate receipts of two half-years would be entirely futile and misleading. However, on the 22nd May last, the agreement to which I have alluded having been concluded and ratified on all sides, we recurred to a tariff of two shillings a word, and our experience since our recurrence to the tariff is so far satisfactory. Now, gentlemen, the next topic to which I would draw your attention is as to the expenditure of the half-year. The real expenditure which we can control, of course, is only that of the offices in London and at the stations, and the money laid by to renewal fund. The payment of different expenses connected with the working, independent of the office expenses, are permanent charges, and cannot be very much diminished or increased, but the expenses at the offices admit either of reduction or of increase. It will be satisfactory to you to find that at the head office in London during the last year we have been able to make economies to the extent of £300 a year (laughter). I do not understand the meaning of the laughter. Perhaps you would have rather seen an increase of £300. The different items of expenditure at the central office show an increase of £150 12s. 3d. against a decrease of £474 8s. 3d., showing on the balance a reduced expenditure at the head office of about £325 a year. The expenditure at stations shows a very different result. There the increased expenditure has been about £4,400 a year. Out of this we must deduct a very large expenditure for the provision of new instruments which, of course, became necessary from time to time. We have been obliged to pay £1,000 for new instruments, and we have also been obliged to pay for the use of a patent for the Wheatstone instruments. With reference to this increase of the expenditure at stations, the last time I had the pleasure of addressing you here, I mentionod that, of course, the reduced tariff involves additional work. The only object of reducing the tariff was to increase the number of messages sent, and an increase in messages sent necessarily involves an increase of persons engaged to send them. You cannot do double the work with the same number of people, and that accounts for the increase of expenditure at the stations to which I have alluded. You will find an increase in every item of expenditure which involves the employment of increased number of persons to do your work. There is an increase under salaries and wages of £1,200; an increase in the maintenance of old lines, in stationery, and in lodgings, fuel, and provisions. That accounts for a large portion of the increase in expenditure during the past half-year. We may look for economies in this respect in the future, because as we have raised our tariff we shall not have—of course we are very glad to have it—additional traffic which would cost us more to carry. I am afraid the increased tariff must necessarily reduce the number of words sent and will enable us to make economies in the expenditure. So much for the receipts and the expenditure. I now wish to say one or two words on the subject of the condition of your plant. The lines are all working well. Within the last few months, as you are aware, the Brest-St. Pierre cable, which has been in the water for thirteen years, developed a fault which suspended its operation. During the last winter we have sent an expedition out to repair that cable, and I am happy to be able to tell you that we have been enabled to raise it in very nearly 2,000 fathoms of water. We are not all nautical people in the room, but I may say that 2,000 fathoms means something over 2¼ miles, and we have been enabled to get up that cable which has been thirteen years in the Atlantic, at a depth of 2¼ miles, and repair it. The repairs are not absolutely complete, that is, I cannot tell you that they are, because we have not received a telegram from the ship, though we expect one literally every moment, to say that it is thoroughly repaired and in good condition. In connection with these repairs we have performed a feat which I think is of some importance. We have laid down in the centre of the Atlantic, in connection with this cable about ninety miles of new telegraph cable. That cable is capable of being raised and added to at any moment. It is a matter of as much certainty as picking it up off the floor of this room, if it lay there, and if it were necessary to make further additions to that new cable; so that I apprehend the life of the 1869 cable will, by the operation we have performed lately, be very considerably prolonged (hear, hear). We have also in that same cable a considerable proportion of new cable within 300 miles of Brest, which we have put in. So that you see we are, so to speak, darning that cable as if it were an old stocking, and making it as good, and probably stronger, than it was before. Well, gentlemen, that is our condition. We have had a good deal of competition from time to time to contend against, and I understand that we are threatened with further competition. Well, perhaps if I were to offer advice to persons inclined to invest their money in new telegraph operations I might be considered as rather an interested counsellor, but I think you may have observed in the newspapers lately letters from my friend on my right here (Mr. Weaver), which appear to me to demolish any chance that this new cable might have had of earning a livelihood. I may tell you that we have gone carefully into the figures and facts connected with the laying of another cable, and I may say that if it comes to a question of hostile competition, we can live and pay our working expenses at a rate of tariff at which it is not possible that that cable could pay its own working expenses. Of course, when I say we can live, it would be a very miserable existence, because we should merely pay our working expenses, and give you no dividend, which I need not tell you is a state of things which I should not like to cultivate, but, on the other hand, our competitors would not be able to live at all—not be able to drag out even such a miserable existence as we should be doing. If men, under these circumstances, are so unwise as to put their money into these undertakings, all I can say is they deserve the fate which I believe they will receive. We are told that these additional telegraphs are required in the interests of the public. The public want to have telegraphing cheaper than they have got it already. Now, it is not necessary to go back to the history of our company in order to show you the enormous reductions made by the board before the question of competition arose at all, in their own interests and with a view of stimulating and increasing the traffic, and thereby bringing in a larger income to the shareholders; but, gentlemen, there is another consideration which I have mentioned before in this room, and that is when such a competition as that which I have attempted to describe arises in which we can make a subsistence, and in which our competitor cannot live, depend upon it the next step in the interest of the public will be a combination for which the public will have to pay. There is nothing in existence more true than that you cannot compel capital to work gratuitously any more than you can force manual labour to work gratuitously, and attempt to force down remuneration of capital below what it will bear, the result to the public will be that they will have a large price for their accommodation, and they will have to remunerate the capital which it is attempted to crush in this fashion. That is my deliberate opinion. I believe that where combination is possible competition is out of the question. The public are interested in increased facilities and cheaper telegraphing, but they will have to pay a larger amount for the accommodation they will derive from these numerous cables than if they were satisfied with a fair rate of tariff from the cables which already exist, and which are more than sufficient to do the business which the public supplies them. Gentlemen, I do not think that it is necessary for me to trouble you with any more observations. This, as you are aware, is the off half-year. We have no dividend to declare, nothing of that description to bring before you, and we merely meet you for the purpose of keeping you fully informed as to the state of your undertaking and as to the condition of the company, and I shall, therefore, merely conclude by moving that the report of the directors and accompanying statement of accounts to June 30th, 1882, submitted to this meeting be, and the same hereby are, received and adopted.

Sir James Anderson seconded the motion.

Mr. Trotter said that he was quite certain that the board had exercised its best judgment in the administration of the affairs of the company, but he did think it was open to discussion whether their policy, as it had been explained to them, was the wisest possible. Their policy had been combination, to endeavour to create a monopoly. That policy was one which was not favourable to their interests, and he ventured to think that if there was truth in the remark of the noble chairman that the public would have eventually to pay for competition, it would come to this, that in any enterprise whatever the public would have to pay for all capital invested, whether well or ill. He did not believe in that. Upon the last occasion on which he had been present at a meeting of the company, about five years ago, he had just returned from America, after travelling some 25,000 miles in the country, and he then ventured to state his belief that the true policy of their company was not in combination, but in treating the public in a liberal manner, in being content in the first instance to make smaller profits, and meet competition as it arose. The tariff of one shilling for twenty words was anticipated as fatal to the prosperity of the telegraph companies; but they all knew how Mr. Rowland Hill was scouted when he prophesied success for the penny postage, instead of rates of 1s. 6d. and 2s. 6d. Now, he did believe that every combination, every endeavour to create a monopoly, had resulted in a considerable fall in the value of their property (hear, hear). He was seriously concerned to see their property at 50 per cent. discount, which meant a depreciation of its market value to one-half of the whole value. He thought the policy had not been successful, and he ventured to believe that if they had been content with the low rate per word, and had left the traffic to increase, as he believed it would have done, by itself, they would not have stood there that day to receive such a small dividend as they now did, or to see their property depreciated one-half in market value.

Mr. Aston said that the question was, was the meeting in favour of combination or not? If it was, then let it go on; but if the feeling was against it let them consider whether it would be wise to pass the resolution submitted before they strengthened the constitution of the board. He must confess that there appeared to him a great lack of backbone on the board. With regard to the effect of combination there had been a great falling off in their value. In August, 1873, after the first combination, their stock was at 90; in May, 1877, it was at 60; in February, 1881, it was at 59; in July, 1882, at 52; and it was now something under 50. These figures were not satisfactory to him. It struck him, too, much might be said besides upon the question of combination. They had now a considerable reserve fund. He did not see why they needed to add to that; they could make a cable with what they had, and if not they should borrow. He did not like to see their stock standing at 50, and he thought they wanted a stronger board, with more strength and more backbone in it. He believed that there was now a vacancy upon it. He objected to that very much. If there was a number fixed they ought to keep to it. He would move that a committee be appointed, and that this meeting be adjourned for the purpose of receiving a report from them. He had nothing to say against the board individually, but he did think their policy ought to be opposed.

Mr. Henry Rutson said he only rose to support what had fallen from the last two gentlemen. This policy of combination had gone on for a long time, and it appeared to him not very successful. He thought they would strangle all these new cables if this meeting declared itself against all further combination.

Mr. Newton said that this company would soon have to take steps to fight these new companies. He had always advocated the policy of fighting. He objected to combination, because it was disastrous to the interests of the company. He would like to refer to one or two points in regard to the position of the company. The chairman had told them that they took up their cable from the middle of the Atlantic from a depth of 2¼ miles and put in a new cable, and that they could pick it up as if it were in this room. That fact was one of the most tremendous facts that had ever been announced at their meetings (laughter). It established their property in such a manner that they need have little regard even for their reserve fund. They had been always accustomed to hear that the life of a cable was ten years. It was very clear that they had now got a substantial property, that they were really now remaining in it as investors, although they were very little else than speculators at the present moment, considering what a very fluctuating property theirs had been, and how serious was their position as regards competition and dividends. With reference to competition, it struck him that in America it was prosperity which brought new schemes into existence. He had read in one of the evening papers this week that there was a new combination established in America simply because there were such wonderful dividends coming out of them. In this country it seemed to him that adversity brought new schemes into existence. The adversity of shareholders in these companies was always the forerunner of a new competing scheme. There might be some connection between the two as regarded operations on the Stock Exchange. He had heard it explained as being a great mystery, and that the only explanation was that investors were crops of fools that were continually being gathered in by promoters. He thought the Atlantic afforded to cable makers a great field for plunder. Cable contracts amounted to a sum of money something like 1½ millions, and in that there was a vast deal of plunder. The makers of cables found some people, who were not fools, to provide the means of getting a contract. Out of every £100 subscribed there was a percentage for insurance. Then the cable was underwritten, and in all probability, notwithstanding that this European cable scheme had been knocked on the head as far as investors were concerned, it might come into existence from the fact that the cable was already underwritten, and the gentlemen interested protected by a system of insurance. The way to fight that sort of thing was that of combination, which they had always adopted. He was not going to say anything personal, or make remarks against particular directors, but he did wish to make a few remarks against boards in general. It was not the adversity of shareholders that brought these new companies into existence, it was the tremendous prosperity of the directors (hear, hear). If they allowed that sort of thing to go on, they would become speculators, and he could prove it. It was one of the abominations of the City of London that shareholders are plundered by directors of the highest character and reputation (laughter). He held in his hand a list of fees paid to directors in cable companies—companies which were controlled by gentlemen whose names appeared on various boards. He trusted he was saying nothing offensive—he was simply speaking in the interests of the vast majority of investors in this company—those who put their money into it for interest only. The duty of directors was something beyond that of merely receiving fees (hear, hear). In that list which he held, it was shown that the directors of telegraphs were receiving £34,525 a year, and yet when they were attacked all round, the directors did not fight for them (name, name !). He had not made it up with names; he was not going to mention names. It was a question simply of policy and principle—it had nothing to do with names. If he were to begin naming names, there would be simply animosities all round. He had seen animosities enough raised by the way in which he had attacked principles, and he did not wish to increase these by attacking names. He held a list of the fees in the Anglo-Brazilian, the Direct, the Eastern, the Eastern Extension, the Globe, the West Indian, the River Plate, and the Telegraph Construction. But the directors of the Telegraph Construction earned their money beyond all others—he would not cast a single reflection on the Telegraph Construction. If ever a board of directors earned their fees, it was that one. He simply included it because it belonged to that charmed circle which they so often saw referred to in the newspapers. Well, in that number the fees paid amounted to £21,750. On these prospectuses they would find magnificent institutions—institutions which there was no equal to. The London and Westminster Bank actually figured there in a prospectus which was the concoction of a gang of speculators. Great dock companies were also represented on the board, who came forward with a subterfuge calling themselves trustees. These gentlemen were not fought as they ought to be. They should have fought the last French cable to the death not only of the shareholders but of the directors as well (hear, hear). But what did they do when they came to the point of destruction of the property? They left the men who were responsible for it untouched; the trustees, who were always trustees before they became directors, in the comfortable possession of some thousands a year. Some of these gentlemen earned more as directors than they would ever have done had they been twenty years in the business they "directed." That was the point to which this company should direct itself, and to which a committee should direct itself, that the question should be fought not merely as against the proposed new schemes, but against those who were behind the schemes, and names never mentioned except at meetings of the shareholders. The French scheme was fought so far, but they did not fight the directors on that occasion. They allowed one whose name should never have been allowed to remain on any board to remain at that board (oh, and name). It was not for him to mention names. Those who knew these things as he did should look for themselves. That statement of his could not be disputed, and they must sooner or later fight them to the complete death, and not to the half death, in the interests of their shareholders. Punish the shareholders, but punish the directors too, and let the latter have the most of it. Don't let directors sink into splendid positions—sinecures—where they barricaded themselves with proxies, and got an annuity for the rest of their days whether they worked or not. With reference to the European, American, Canadian and Asiatic Cable Company he found that it was now on its very last legs. He might tell them that, for he had seen a circular sent out in the usual way, which was an announcement that if any of their stock was disposed of there would be a large commission given for doing so. That only bore out what he had said of the margin which lay between the capital of the real money received spent in these commissions, and in sums for insuring.

Mr. Griffiths thought that the application of the word *combination* to the company was not a fortunate one. The company had started with a moderate capital, and the stock had been watered. Mr. Newton had made some very able remarks, and certainly it was not wise that they should continually combine with other companies if the combination was merely for their advantage; but he hardly agreed with all that he had said as to the question of policy. He thought they might gain much more by the development of telegraphy and by allowing affairs to take their own course. Nine-tenths of the commerce of the world was carried on through the agency of the telegraph, and as commerce increased so must telegraphy; but whether they combined for peace or war he could not say that he thought the policy pursued during the past twelve months had been altogether satisfactory. They had lowered their rate to one shilling, and for nearly ten months they had carried messages at a price which was hardly remunerative. What wonder was it if the dividends fell off? They were fortunate in having on their board gentlemen of great ability; but on the other hand, they should remember the remarks of Mr. Newton, that there were gentlemen of great ability who were not on the board (laughter). He should certainly be in favour of combination or of getting a few of such directors on their board. An increase in the number of their counsellors would take away from the enemy the chance of so well managing their schemes. He thought by that means that they would be more likely to retain their dividends than by lowering their rate and anticipating warfare. The present position of their company was somewhat critical. He was sorry to hear Viscount Monck remark that they could not compel capital to work gratuitously, at least, if so, that the public would ultimately have to pay for it. That was somewhat ambiguous. It was true the public might have to pay by subscribing additional capital; but he was afraid they would also have to pay for it by losing their dividend. He thought, therefore, it would be wise to follow the plan already suggested, that they should rather look to the increased development of trade, and seek to gain their fair proportion of the trade than go to war and lower their dividend to so great an extent. They would also by that means avoid the necessity of having such large renewal funds.

The Chairman: I am very unwilling at a meeting of this kind to appear to intervene before full discussion has taken place, and I have therefore abstained from stating my views at an earlier period of the resolution which has just been placed in my hand by the gentleman at the other end of the room. Now, gentlemen, you are all aware that this meeting is not one which has been called for the purpose of discussing the action of the directors or the constitution of the board, or anything of that sort. No notice has been given of this amendment, which has been sprung as a surprise upon us in the room without our knowing that there was any intention of anything of the kind. It is not an amendment of the resolution which I had the honour to propose at the opening of the meeting, because that resolution merely referred to the report and accounts which have been laid before you, and according to the established rules of order which guide all meetings, it is therefore entirely out of order, and I should be acting exceedingly improperly if I allowed it to be put to the meeting. But, gentlemen, there is another reason which I wish to lay before the meeting quite independent of the question of order. It is this: There are in this company upwards of 5,000 shareholders. No action of the board attacking the interests of the company has ever been taken—I mean any considerable action—without these shareholders having been called together, consulted, and allowed the opportunity of expressing their opinion upon it (hear, hear). On no occasion of this description has there ever been any opposition to the action of the board. I might almost say that literally; but, at least, if there has been any partial opposition it has been of such a character as ought to bring out into stronger light the unanimous support which the board receives from the great bulk of the shareholders. I have no personal feeling in the matter, and Mr. Newton may be perfectly certain that I entertain no opposition to his discussing my position in any way that he likes, but I do not think it is fair to the board, or fair to the shareholders of the company, to allow a meeting such as I see before me, however respectable the individual gentlemen may be, a meeting which numerically bears no proportion whatever to the shareholders of the company, I do not think it would be right for me in such a meeting, even if the amendment were quite in order, to allow it to be put. If any dissatisfaction of the action of the board is felt, let notice be given fairly at a half-yearly meeting. If it is considered to be of such an urgent character as to require to be discussed before the next half-yearly meeting, the articles of association provide means by which, within a very few days, we can get the shareholders together, and get their opinion honestly and fairly upon any proposition which might be made to them; but, gentlemen, I cannot stand here, if even this amendment were in order, and allow it to be put to a meeting numerically composed as this is, in the absence of the majority of the shareholders. It is no disparagement to the gentlemen present to say that they are a mere drop in the ocean compared to the number of shareholders in the aggregate. On both these grounds I, as chairman, decline to put the amendment to the meeting. The articles of association provide that an extraordinary meeting may be called if the requisition, by any number of shareholders not fewer than five, and holding in the aggregate not less than 5,000 shares, with a full statement of the object of the meeting, be delivered to the secretary or left at the office. That is the course provided by your articles of association for considering such a proposition as this. I challenge those who have brought forward this proposition to take the constitutional course provided by these articles, and I shall be ready to meet them foot to foot and hand to hand whenever they take that course and propound their resolution before a meeting of shareholders properly called for the purpose of considering that resolution.

Mr. Aston submitted that the resolution was entirely in order. He felt very much flattered by the objections taken by the chairman, because they seemed to imply that if the amendment were put the meeting would endorse and pass it (no, no). One part of the amendment was certainly in order, for the meeting had surely the power to adjourn. He would suggest an adjournment to the 3rd November, whether they appointed a committee or not. He did not see the use of calling shareholders together on every point that arose, and spending £18 or £20 in doing so. It was no new point that had been sprung on the board. All the world was full of the combination question. Had they not found themselves face to face with combination after combination and company after company? He did not wish to press this against the feeling of the meeting, but he was certainly in order in moving an adjournment. He did not come with a formal resolution prepared, but simply to express his feelings, formed with some deliberation, that there was not enough backbone in their board, and that they wanted new blood.

Mr. Newton thought it a misfortune and a mistake that the amendment was not allowed to be put. Those who came there did so at considerable trouble; those who stopped away did so for their pleasure, and he objected to a meeting of shareholders being prevented from an expression of opinion. The board unquestionably had the confidence of that meeting. He objected to resolutions being brought forward without intimation; but he did not object to a gentleman who felt aggrieved bringing the policy of the board before the meeting. If it was put it would only show who supported him, and so assist the board in forming an opinion in regard to the popularity or otherwise of their course of action.

Mr. Humphreys said that one objection taken by the chairman was founded on a perfect fallacy. All the shareholders had the same privilege of coming to a meeting of this kind as they who had come, and, therefore, if anything were done in the absence of those, they ought to suffer and not they who were present. To say that they should not entertain the question because the meeting was numerically small was a fallacy he must protest against as contrary to English law. In a parish vestry, for instance, the old parish could be taxed if only three parishioners were present; and in all meetings of this kind, those who were present could act as they pleased without considering those who were absent. In regard to combination, it was true that no sooner had they come to peace with a competing company than some other company rose up and they were again in hot water. But the question was, how could they stop it? He thought fighting was the best way to stop these new companies rising continually and claiming a share in their profits; and no doubt companies were formed simply in expectation of their coming to terms with them, and for nothing else. He did not think, however, that the laying of these new cables was injurious to this company, it was rather beneficial (laughter). Decidedly he did. If they could buy new cable at half the money they were made for where was the disadvantage? As to this new cable company it was not likely that anybody would give £100 for shares, while their own shares were at £50. The English people were not such silly folk as to give £100 when they could buy the same identical thing for £50. Therefore that new company was not altogether opposed to them, because cables naturally wore out, and it was something to get a new cable at half its cost.

The Chairman said that he thought his position had been rather misapprehended. The last speaker had told them that a meeting of shareholders had a right to do what they liked; but if they meant to conduct business in a business-like way, they must conform to the rules which regulated all meetings whatever, and to the constitution of the company to which they belonged. He, as their chairman, deliberately announced his decision that that amendment was out of order. If they were dissatisfied with that, he presumed that the theory of English law would apply, that there was no grievance without a remedy; but standing there as their chairman, it was his right to say what was out of order, and he deliberately pronounced that amendment to be so. The reference to the numerical character of the meeting was merely to show that he had not been actuated solely by a technical question of order, but that there was a substantial reason why they should not allow a small number of gentlemen to pronounce on the interests of the 5,000 shareholders of that company. He would now put the resolution to the meeting.

The vote having been taken, the Chairman said: I pronounce the resolution carried, with four dissentients.

Mr. Aston: The amendment clearly might be put.

The Chairman: The resolution is carried; I decline to put the amendment.

Mr. Burt, solicitor to the company, said that he had had considerable experience of such meetings, and he thought Mr. Aston must be well aware that it was irregular to put such an amendment to the meeting, and he begged to say that the chairman was perfectly warranted in the decision come to, not only by the ordinary rules of conducting public meetings, but by the particular regulations of the company. He should be exceedingly sorry if such a thing had been done without any notice whatever, which would have been a great injustice to all the shareholders.

Mr. Aston said they were perfectly within their right in adjourning the meeting. (Mr. Aston then left the room, making use of a strong expression against Mr. Burt.)

On the motion of Mr. Newton, seconded by Mr. Smith, a vote of thanks to the chairman was then unanimously adopted. The chairman briefly responded, and the proceedings terminated.

SOUTH EASTERN (BRUSH) ELECTRIC LIGHT AND POWER COMPANY (LIMITED).

An extraordinary meeting, followed by a statutory meeting, of the above company was held on Wednesday last in the City Terminus Hotel, Cannon Street, General Sir Michael Kennedy, R.E., chairman of the company, presiding. The Secretary having read the notice convening the meeting,

The Chairman said: Gentlemen, this is a special meeting convened for the purpose of making certain alterations in our articles of association. These alterations have been dictated to us by the Council of the Stock Exchange, and it is necessary that they should be made before the Stock Exchange will grant us a quotation. They have already granted us a settlement, but we are not in a condition to apply for a quotation, inasmuch as we have not sufficient capital paid up, that is, under a recent rule of the Stock Exchange a quotation is not granted except in cases where capital is paid up to the amount of £50,000. The alterations we have met to consider are not very numerous or very important in their scope, and in no way affect the interests of the shareholders, and no doubt you will approve of them without any difficulty. The first is in article 4, and the object of it is to prevent the directors, without the assent of a general meeting, issuing any shares at a discount; that is, to prevent the directors from watering the capital. The next alterations are in articles 81 and 89, and they have for their object the reduction of the term of office of the first directors from the year 1886 to 1884. The next is the omission altogether of article 85; and this the Stock Exchange require to be expunged apparently for the reason that it would enable important considerations to be decided by correspondence, instead of being thrashed out in a general meeting. The alteration in article 100 is similar in its scope, but it has application to the directors; that is, to prevent in the same way the matters which properly ought to come before a meeting of the directors being settled by correspondence. That is all, gentlemen. With these remarks I beg to move "That the articles of association be, and the same hereby are, altered as followed:—

"(I.) By the insertion of the following words at the end of article 4, 'Provided always that no share shall be issued at a discount without the sanction of a general meeting.'

"(II.) By the alterations in articles 81 and 89 of '1886,' therein mentioned, to '1884.'

"(III.) By the omission of articles 85 and 100."

Mr. F. Fesser seconded the motion, which was then put to the meeting and carried unanimously.

The Secretary then read the notice convening the statutory meeting, and

The Chairman said: Gentlemen, this is our first statutory meeting. As usual on such occasions we have not very much to communicate to you. Electric undertakings, like all other enterprises of a similar character, require after their commencement to work on gradually to development. Up to the present time our work has been chiefly with preparation and organisation for the business which is no doubt before us as time goes on, and with the decline of the year, when the demand for electricity will no doubt become greater than we can expect it to be during the long days and short nights of the summer. The company was incorporated on May 2nd with a capital of £100,000 in 20,000 shares. 104,730, or more than five times the number offered, were applied for, and, including 400 paid-up vendors' shares, all these were allotted. As soon as we were in a position to do so we applied for a settlement, and the date of our application was June 3rd. A settlement wa obtained on the 29th of that month, but under a recent rule we could not obtain an official quotation till capital has been paid up to the extent of £50,000. We did not consider it advisable to make a call of £1 per share due on June 1st, because we had no immediate prospect of utilising the money advantageously and we thought it would be more in the interests of the shareholders that we should not call up additional capital until we were in a position to employ it advantageously. We engaged offices at 110, Cannon Street, and we made arrangements by which we shared those offices with the Provincial Brush Company, and of which you are aware your directors are also the directors. Mr. Offor, our first secretary, we appointed our manager, as we thought his great experience in electric business in general, and of the Brush in particular, would be more advantageous than if we continued to employ him in the purely ministerial office of secretary. You are also fortunate enough to have the services of Mr. Beeman, as electric engineer. This gentleman was Electrical Inspecting Engineer of the Anglo-American Brush Corporation, and had had charge of the City lighting. He is an officer of experience and of talent, and has patented several useful inventions in reference to electric lighting and appliances. Under our engagement with him we are entitled to share in all his future discoveries, and I may say we see the dawn of great advantages in that respect to us. I cannot, at present, enter into details. It would not be right or proper to do so; but I may say I see the dawn of the near approach of results which I think will be very advantageous to this company. Mr. Offor, Mr. Beeman, and our secretary, Mr. Jermyn, also act in similar capacities for the Provincial Brush Company, an arrangement which is beneficial and economical to both companies. As soon as our organisation had been completed we took plans to lay the foundation for the important business which is, I have no doubt, eventually before us. We advertised in the local papers in our three counties, and we circulated widely a pamphlet drawn up by our manager, which gives full information regarding our system—the Brush system, and with details of prices and cost of installations and other useful information. Our manager, our travellers, and some of our directors also visited some of our chief towns, and I may say they were everywhere well and favourably received, and I am bound to add in every case the answer was that however well disposed to us, they could not take any steps until the bill now before Parliament had become law. In addition to other business, we have carried out successfully a very large installation at Parkeston Bay, near Harwich, for the Great Eastern Railway Company. This I believe to be only the forerunner of a very much more extensive business in that direction. Generally, I may say, we have had numerous applications from firms and individuals in reference to installations in the use of our system, but we have been met by two difficulties; one is that which I have already alluded to, the want of legal powers, for getting down our mains, and means of supplying electricity; and the other with reference to a secondary battery or accumulator; which we find to be most important, and, indeed, an essential component part of every large system of incandescent electric lighting. Both these difficulties, I may say, are now in process of being removed, and will, I believe, shortly disappear. We have taken part in a very important movement, and have joined with the other Brush companies in forming a Brush council or conference, which will take into its consideration subjects of common interest, and will concert common action and protect common interests. Delegates from each of the companies concerned have already met, and have considered and arranged their future mode of procedure, and have already passed some important resolutions in reference to the quality and price of the machinery and plant which under our licences we obtained from the Anglo-American Brush Corporation. I think you will see that as all the Brush companies work under the same licence, but on totally distinct and separate ground and localities, that their united action must be very powerful and cannot but be very beneficial to the common Brush interest. I will now say a few words as regards the Electric Light Bill. All those concerned in electric lighting must have followed the course of this bill with a great deal of interest, probably not unmixed with a little apprehension. I was prepared to address you on this subject in a somewhat different strain, but I am happy to say that the bill in committee was yesterday amended in a very important particular, and the period for which licences may now be granted with the assent of the local authorities, was altered from five, as originally drafted, to seven years, and the period for which provisional orders can be procured, with the assent of the local bodies, has been altered from fifteen years to twenty-one years. This concession, taken in connection with the compulsory sale clause, is very important; but I think, gentlemen, that as far as lies in us, we should not stop here, but should endeavour by agitation and such means as may be within our power, to obtain a revision also of the compulsory purchase clause. That clause seems to me to be extremely inequitable, for it provides that electric undertakings should be compelled to sell their works at the close of the period named for the mere value of the plant and the material, without any allowance whatever for the goodwill of the concern. I do not think, gentlemen, that this clause can stand, but at present we must do the best we can as it has been amended. It is very encouraging to find that there is a general and growing opinion that there is a great and immediate future for electric lighting, and wherever this subject is discussed, whether it be in Parliament or out of Parliament, or in the columns of the public press, that view appears to be strongly held, and I for one am entirely in accord with the remarks made in a leading article in the *Times*, on the 7th July last, to the following effect: "that there was a vast field for electric work, and so far from having to educate the public to the use of electricity, as some would seem to think it required, those concerned in its distribution will be speedily applied to by more customers than they can deal with." Our own experience, I may say, already tends that way. As regards our action in connection with the Electric Light Bill, I may state that for some time past we have had under careful consideration how we should act. I cannot enter into details now. It would not be advisable to do so, but I can assure you our arrangements are such that we can take necessary action as soon as the bill is passed.

Mr. Robinson asked whether any operations were at present being carried on by the company, or whether any contracts were made.

Mr. Stewart asked whether they had carried through any negotiations for the sale of sub-concessions in their district.

The Chairman said that, besides the work at Harwich, they had negotiations a-foot in a great many places which would, he believed, be successful when the difficulties were removed which at present were interfered with by the state of the law, as to the opening up of streets, and getting in their mains and wires. As to the sale of concessions, the same difficulty was before them, and as soon as they had legal powers he had no doubt they should obtain applications for concessions in various quarters, but that was not likely as long as the matter remained uncertain.

A Shareholder asked whether it was intended to make a call.

The Chairman said that he had already explained that they did not call up any money because they did not require it at the moment, and they thought it was preferable to leave it in the shareholders' hands than keep it unemployed at their bank.

Mr. Stewart asked in what securities they had placed the money in hand, so as to be yielding the company a fair return.

The Chairman replied that the greater part of it was in their bank on deposit, yielding a small amount of interest.

A Shareholder asked whether the prospects of the company were as good now as they were at first. He thought that gentlemen there were very well aware that a great stimulus had been given to the gas companies by the bringing out of electricity, and it would be interesting to know whether gas was going to carry the day, or whether the electric light was likely to get into favour. There had been a very interesting statement made in Parliament lately, namely that upwards of 90 applications had been made for the introduction of electricity, and he thought they would like to know if this company was one of those that had made that application to the Board of Trade.

The Chairman said their prospects were certainly as bright now as they were when they first commenced; he thought considerably brighter, because they were now approaching a time when they could really take, as he hoped, effective action. Up to the present they had not been able to take any action for want of legislative powers, and, until they had these powers, they could not commence to compete with the gas companies, as he hoped they should be able to compete successfully.

In reply to another question, in regard to the obtaining of some accumulator,

The Chairman said that they had hopes and prospects of settling that very question soon. He could not say more at present, but he hoped they would be content for the time being with what he had said. He would add that this company was not one of the number which the Lord Chancellor had stated would make application. He had no knowledge whatever of who had made them.

Mr. F. Fesser (vice-chairman) said he should like to say a few words in reply to some inquiries made by gentlemen opposite him as to whether their prospects were now as bright as they were. When they issued their prospectus there was a mania raging, and a very great deal more was expected of the electric light and of the capital invested in it than ought to have been. At the present moment it seemed that they had rushed into the opposite extreme and fallen into a condition of despondence, and many of those who had thought the electric was the light of the future had begun to think that there was no hope of competing successfully with gas. Some remarks made had echoed that same feeling which seemed to be undermining the public sentiment. In his own opinion their prospects were very considerably brighter now, because the science of electric lighting, although new, was making such gigantic strides, and they were hearing every day of such enormous advances that they had not the slightest doubt it would supersede every other method of lighting. A great deal had been said of the result of the tenders for public lighting in the City, and he was sorry to say that most remarks that he had seen in the public papers seemed to show that the result of these tenders was incontestably that the electric light had proved five or six times as dear as gas, and it was quite impossible to compete, and that there was an end of the whole matter. Now, if they took any gas company in England, except that which happened to have mains laid down in those particular streets for which the City Commissioners had invited them to supply one year's lighting, and were to ask that company to tender for lighting it for one year, they would find that the gas would not be four or five, but twenty, and perhaps even fifty times more than the privileged gas company was at present charging. The terms of the electric light contract were that they were to supply the lighting for one year, that was, erect their plant and machinery, and remove it at the end of the year; on these terms it was impossible to compete with gas; but wherever electric lighting was allowed fair play, it was not only infinitely a more brilliant and wholesome and pure light, but very much cheaper. If any railway company were to erect any gaswork to do what they were doing at Parkeston Bay with the electric light, it would be quite too terrible, and they must act under the same conditions as those which the gas company acted—on the same footing; then they should then be able to compete with gas, but not before. He hoped that before many days they would have the law in their favour, and be able to lay down their wires on a fair footing. Then they must remember that the gas companies did an immensity of private lighting, and that enabled them to supply the public lamps more cheaply. The electric companies must have the same privileges. As soon as that bill became law he felt sure that they would be able to beat gas.

Mr. Hesse asked if they had a quotation.

The Chairman replied that they had not, as they had not yet £50,000 paid up capital.

Another Shareholder asked whether any formidable competition was likely to arise in their districts with other companies.

The Chairman remarked that they did not anticipate competition, but their Manager, Mr. Offor, would perhaps give them his experience on that point.

Mr. Offor said that the obvious answer to that question was that the survival of the fittest would be the rule that governed their success. They believed that the Brush system was the only practicable one at the present time, and therefore they felt confident that no competition could ultimately oppose them to any serious extent. The public mind was to a certain extent confused by the recent Crystal Palace Exhibition. A large number of lights were burning there connected with different systems, but without the slightest evidence of the cost of producing these lights. He might mention that the Brush system had been carried on in the City at a very small cost indeed compared with the lighting of similarly extended districts by Messrs. Siemens Brothers, whose light had now disappeared from the City, owing to its great cost. The Brush light, in a circuit of 3½ miles, had been wrought from one dynamo machine running in their works at Lambeth; whereas the Siemens light required for a somewhat smaller circuit, he believed, 12 or 14 dynamo machines. He might mention also, that in the case of the installation at the Great Eastern Railway Company's station at Parkeston Bay, their contract was based upon their supplying the light within one week from the date of it. They had undertaken that, and done it within the week. That showed that the skill now at the disposal of the company was sufficiently efficient to enable them to carry out any work of that kind. He had visited many of the towns in their district, and had had a great deal of correspondence with officials connected with councils and local boards, and he found in all these towns that there was a gas interest opposing the electric light interest. In one town the people had determined that next November representatives should be returned who would support the introduction of the electric light, as opportunity offered. In addition to the installations there had been also many smaller installations for the purpose of making their light known without expense to the company, and they had done that by means of a portable apparatus which they could readily send from one part of the country to another, and with the aid of this apparatus in a few hours they could give the light of 12,000 candle-power. During the present week they had carried out installations of that kind at Richmond. On Monday they lighted an enormous fête attended by fifteen or twenty thousand persons. There in a few hours they had their lights installed and running, and it created a great deal of public interest, and would be followed, no doubt, by some arrangement being very speedily carried out by the local authorities of Richmond, who had now had an opportunity of seeing the light. Last night they lighted up a Blue Ribbon Army meeting, and considerable interest was manifested in the light. All this they had been doing in different parts of their district, and with the believed, very satisfactory results.

Mr. Robinson inquired whether the company had the power to light private houses?

Mr. Offor replied in the affirmative. The company possessed not only the arc lamp, which was suitable for the larger spaces, but also the incandescent light, which was suitable for smaller sized rooms. This company had a contract from one gentleman at Eltham, who was going to pay the company three times the price he had hitherto paid for gas, for the privilege of having the incandescent light in his house.

Mr. R. Cunningham (a director) said he might add that he had been to nearly the whole of the towns in their district. He had seen no competition, and their company had been first in the field.

No further qnestions being asked,

The Chairman said they had given the shareholders all the information in their power, which he hoped had been satisfactory to them as far as it had gone.

On the motion of Mr. Briers, seconded by Mr. Comberbatch, a vote of thanks to the chairman was unanimously adopted, and the proceedings terminated.

PROVINCIAL (BRUSH) ELECTRIC LIGHT AND POWER COMPANY (LIMITED).

On Wednesday, at the City Terminus Hotel, Cannon Street, under the presidency of Sir Michael Kennedy, an extraordinary general meeting of the members of this company was held for the purpose of considering and, if thought advisable, of passing as a special resolution certain alterations in the Articles of Association, which were to precisely the same effect as those set forth in our report of the South Eastern (Brush) Company, reported in another column.

The notice convening the meeting having been duly read by the Secretary, Mr. Alfred Jermyn, a resolution for alteration was moved by the Chairman, seconded by Mr. F. Fesser, and carried unanimously.

The first statutory general meeting was then held, in opening which the chairman repeated in substance the remarks he addressed to the sister company, the South Eastern Brush Company, and reviewed the prospect of more work for this company during the winter. The company, he added, was incorporated on May 8th with a capital of £200,000 in 40,000 shares. 134,376, or more than six times the number offered, were applied for, and the whole available number—20,000 shares—were in the first instance allotted. Owing to certain withdrawals, which the board considered had legal force, the total number now allotted was 19,841. As soon as they were in a position they applied for a settlement, and their application was dated the 13th of June. As, however, it took some time to settle such matters, they had not yet obtained a settlement, but they expected to do so daily. They shared offices with the South Eastern Brush Company, and the same officials acted for both companies. In addition to other business, the company had installed lighting at Bedford, High Wycombe, Sudbury, and Stowmarket, and they had had numerous other applications. Having alluded to the Electric Lighting Bill, to the Brush council or conference, and spoken of the position of the company in reference to them, he remarked that the company had matured their plans, and were prepared to put them into force as soon as the Electric Lighting Bill became law.

In the meantime, he might say, as regarded competition, that they had a good and well-tried system, and also an efficient and energetic manager (Mr. Offor). Frankly, he might say that as regarded ultimate results, he did not think there was much to choose between any of the principal electric systems; but it was not in that direction that they looked for their benefit. It was in the details by which those ultimate results were attained; and these were matters which would stand them in good stead. They believed their Brush system to be in all respects, as regards the mode of producing the light, and the cost of it, the fittest; and they had confidence that in the struggle for existence which was about to take place it would survive. If any gentleman had any question to ask he should be glad to give him an answer.

After a considerable pause, and no question being put, the chairman declared the meeting at an end.

A vote of thanks to the chairman and directors concluded the proceedings.

The Stock Exchange Committee appointed Friday, the 11th inst., a special settling day in the following securities:—British Insulite Company, Limited, shares; Swan United Electric Light Company, Limited, shares; Australasian Electric Light, Power, and Storage Company, Limited, shares; all the above to be marked; Metropolitan (Brush) Electric Light and Power Company, Limited, shares; Railway Electric and Appliances Company, Limited, shares. The committee have granted a quotation in the following security:—Electric Light and Power Generator Company, Limited, 22,500 vendors' shares.

Application has been made for a special settling day in the Gulcher Electric Light and Power Company, Limited, shares.

LATEST QUOTATIONS.

Authorised Issue.	Share.	Name.	Paid.	Closing Quotations. Aug. 9.	Business Done.
		ELECTRIC LIGHT.			
40,000	10	Anglo-American Brush Co.	4	15½-16½	15¾.16½.⅜.16. ½.¼.⅛.¼
		Do. Do.	10	33 - 38	35¼.½.6
30,000	5	Brush Electric Light & Power Co. (Scotland)	2½	¾- 1¼	5/16.⅞
25,000	5	Great Western Electric Light & Power Co.	2½	¾- 1½	
24,980	5	Hammond Electric Light & Power Supply Co.	2½	7 - 8	7¼.⅜.½
40,000	5	Indian & Oriental Electrical Storage Works Co.	2	1½- 2	
172,500	1	Maxim-Weston Electric Light and Power Co.	1	⅜- ⅝	½
40,000	5	Pilsen, Joel & General Electric Light Co.	2	1½- 2	
		TELEGRAPHS.			
2,116,400*l.*	Stk.	Anglo-American, Limited	100	49½- 50½	50
2,441,800*l.*	Stk.	Do. Preferred } Def'd. receiving no div. until 6 p. c. has been paid to Pref.	100	80 -81	80½.80.⅜.80.⅝.¼
2,441,800*l.*	Stk.	Do. Deferred	100	20 - 21	20¼.20.½.20
130,000	10	Brazilian Submarine, Limited	10	11½- 11¾	
16,000	10	Cuba, Limited	10	9¼- 9¾	9⅝ xd.
6,000	10	Do. 10 per cent. Preference	10	15½- 16½	
13,000	10	Direct Spanish, Limited	9	5¾- 6¼	
6,000	10	Do. 10 per cent. Preference	10	15½- 16½	
65,000	20	Direct United States Cable, Limited, 1877	20	11½- 12	11¾
100,000*l.*	100	Do. 6 per cent. Debenture, repayable 1884	100	101 -104	
380,000	10	Eastern, Limited	10	10 - 10¼	10¼.3/16.10 xd
70,000	10	Do. 6 per cent. Preference	10	12¾- 13	12⅞
232,000*l.*	100	Do. 6 do. Debentures, repayable Oct. 1883	100	99 -102	
200,000*l.*	100	Do. 5 do. do. Aug. 1887	100	100 -103	101½ xd.
200,000*l.*	100	Do. 5 do. do. Aug. 1899	100	100 -105	
199,750	10	Eastern Extension, Australasia & China, Limited	10	11 - 11¼	11 3/16
320,000	100	Do. 6 p. c. Debentures, repayable Feb. 1891	100	104 -117	xd.
500,000	100	Do. 5 p. c. (Australian Gov. Subsidy) Deb. 1900	100	102 -105	
140,000	100	Do. do. registered, repayable 1900	100	102 -105	
100,000*l.*	100	Do. 5 per cent. Debenture, 1890	100	..	
254,300*l.*	100	Eastern and South African Limited 5 per cent. Mort. Deb. Registered redeemable 1 Jan. 1900	100	101 -104	
345,700*l.*	100	Do. do. do. To Bearer	100	101 -104	
22,050	10	German Union Telegraph and Trust, Limited	10	9¾- 10¼	
163,390	10	Globe Telegraph and Trust, Limited	10	6¼- 6½	6¼.1/16.⅜ xd.
163,209	10	Do. 6 per cent. Preference	10	12¼- 12¾	12⅝ xd.
125,000	10	Great Northern	10	12¼- 12¾	
100,000*l.*	100	Do. 5 per cent. Debentures	100	100 -103	
31,200	10	India-Rubber, Gutta-Percha and Telegraph Works	10	25 - 26	
100,000	100	Do. 6 per cent. Debentures, 1886	100	101 -105	
17,000	25	Indo-European, Limited	25	28½- 29½	
38,148	10	London Platino-Brazilian, Limited	10	4½- 5	
12,000	10	Mediterranean Extension, Limited	10	2 - 2½	
8,200	10	Do. 8 per cent. Preference	10	8½- 9	
9,000	8	Reuter's, Limited	8	12¾- 13¼	
280,000	Stk.	Submarine	100	265 -275	
58,225	1	Do. Scrip	1	2⅜- 2⅝	
4,200	Cert.	Submarine Cables Trust	100	98 -103	
37,350	12	Telegraph Construction and Maintenance	12	27½- 28½	
150,000	100	Do. 6 per cent, Bonds, 1884	100	102 -104	
186,750	5	Do. 2nd Bonus Trust Cert.	5	1⅜- 1⅝	
30,000	10	West Coast of America, Limited	10	4¾- 5¼	
150,000	100	Do. 8 per cent. Debentures	..	..	
69,910	20	Western and Brazilian, Limited	20	6¾- 7¼	
200,000*l.*	100	Do. 6 per cent. Debentures "A" 1910	100	104 -107	
2,500	100	Do. 6 p.c. Mort. Deb. series B of '80, red. Feb., 1910	100	97 -100	
1,500	$1,000	Western Union of U. S. 7 p.c. 1 Mort. (Building) Bds.	$1,000	123 -128	
1,030,000*l.*	100	Do. 6 per cent. Sterling Bonds	100	103 -106	
88,321	10	West India and Panama, Limited	10	1½- 1¾	
34,563	10	Do. 6 per cent. 1st Preference	10	8¼- 8¾	
4,669	10	Do. 6 do. 2nd do.	10	6½- 7	
		TELEPHONES.			
154,165	1	Con. Telephone & Maintenance, Ld. Nos. 1 to 154,165	1	1¼- 1¾	1¼ xd.
200,000	1	Oriental Telephone Co., Nos. 100,000 to 300,000	½	⅜- ⅝	
100,000	5	United Telephone Co.	5	10¾-11¼	11.⅛.10 15/16. 11 1/16.⅛.11

TRAFFIC RECEIPTS.

The Cuba Submarine Telegraph Company, Limited. The number of messages passing over the lines of this company during the month of July was 2,948, estimated to produce £2,800, against 2,494 messages, producing £2,397, in the corresponding month of last year. The traffic receipts for the months of May, estimated at £3,300, realised £3,544.

The Direct Spanish Telegraph Company, Limited. The estimated traffic receipts for the month of July, 1882, are £1,846, as against £1,448 in the corresponding period of last year.

The Eastern Extension Telegraph Company. The receipts for the month of July were £30,070, against £31,751 in the corresponding month of last year.

The Great Northern Telegraph Company. The traffic receipts in July, 1882, were £21,640 from the 1st January to 31st July, 1882, £137,200, in the corresponding months of 1881, £137,166, and in the corresponding months of 1880, £131,313.

The West Coast of America Telegraph Company, Limited. The receipts for the two weeks ended the 14th July were £1,825, against £1,675 in 1881.

The Western and Brazilian Telegraph Company, Limited. The traffic receipts of this company for the week ending July 14th, 1882, were £1,828, against £1,901.

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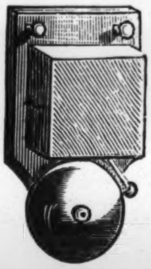

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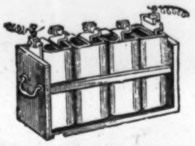

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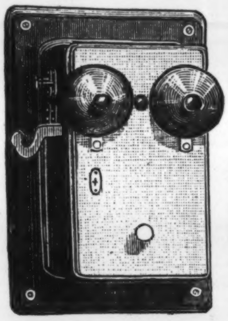

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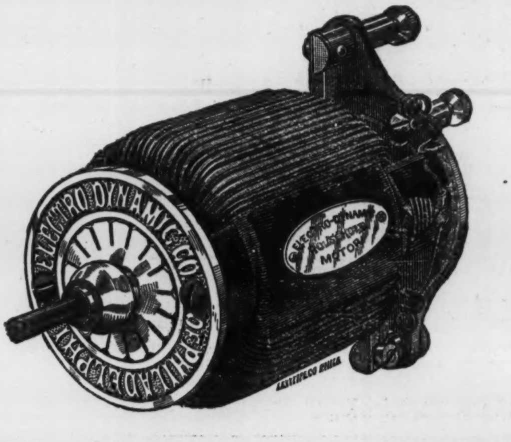

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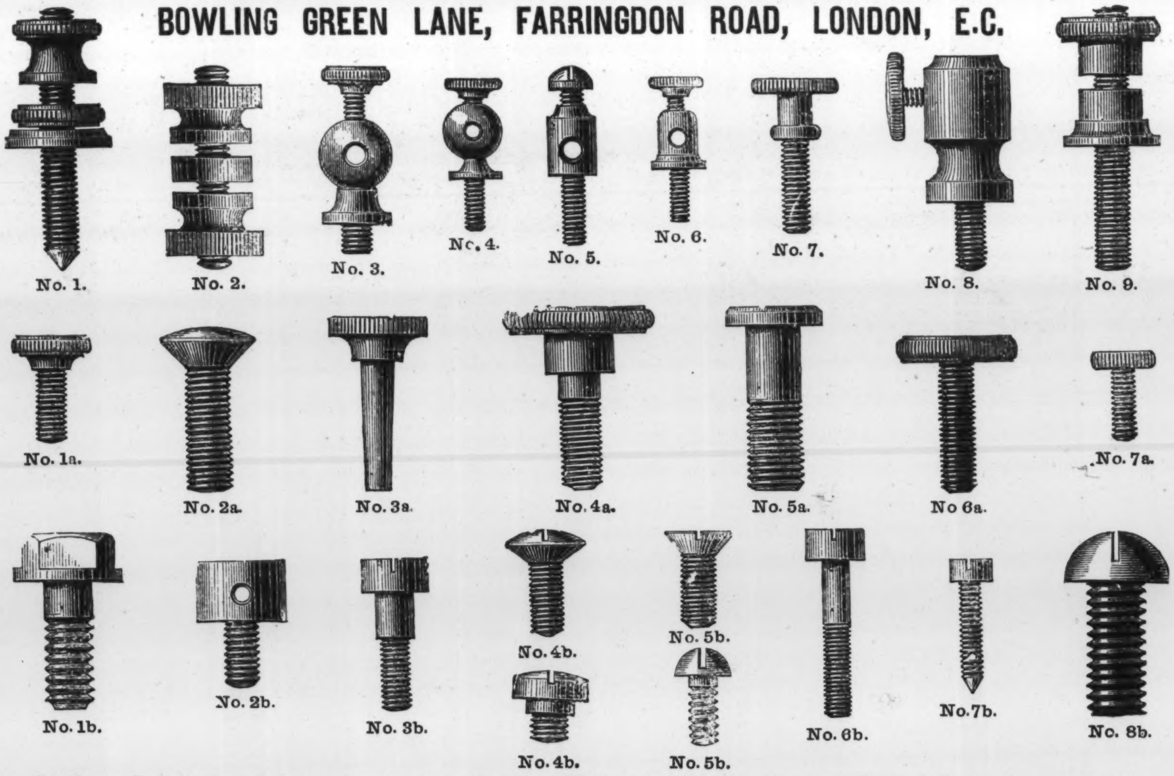
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